JULY 1954

PRECISION METAL MOLDING

INCLUDING DIE CASTINGS MAGAZINE

DIE CASTINGS
INVESTMENT CASTINGS
POWDER METALLURGY
PERMANENT MOLD CASTINGS
PLASTER MOLD CASTINGS
SHELL MOLDINGS

PMM

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Aluminum ALLOYS

Zamak ZINC BASE DIE CASTING ALLOYS

Whatever aluminum or zinc alloy you use, you're always assured of trouble-free production and quality castings. Quality of metal is always uniform; rigid metallurgical control and latest testing devices assure that every pound meets your specifications. Each order, large or small, receives prompt individual attention. Each order is palletized for easy handling and is shipped with a certified chemical analysis.

For complete information and prompt service on your requirements, contact the sales office in your area.

Send for your copy of bulletin showing composition and physical properties of aluminum and zinc alloys.

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Easier! Faster! Safer!...

WITH

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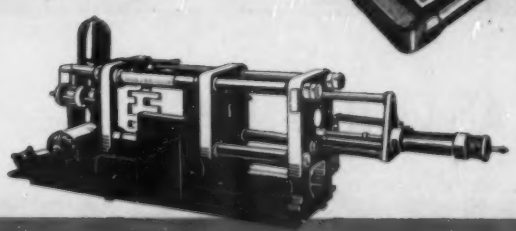
DIE-CASTING MACHINES

Built-in Rack and Pinion permits use of a ratchet wrench to quickly move the complete die-locking assembly in place to accommodate various sizes of dies.

Die-Lock Valve can be shut off and by-passed, with Inching Valve assuring added safety when setting up die. This permits instantaneous, micromatic control.



Faster set-up time is just one of the many "bonus" features which make Cast-Master today's outstanding choice in die-casting machines. To get the complete "bonus" story, send for the Cast-Master catalog, containing illustrations and specifications on eight new models.

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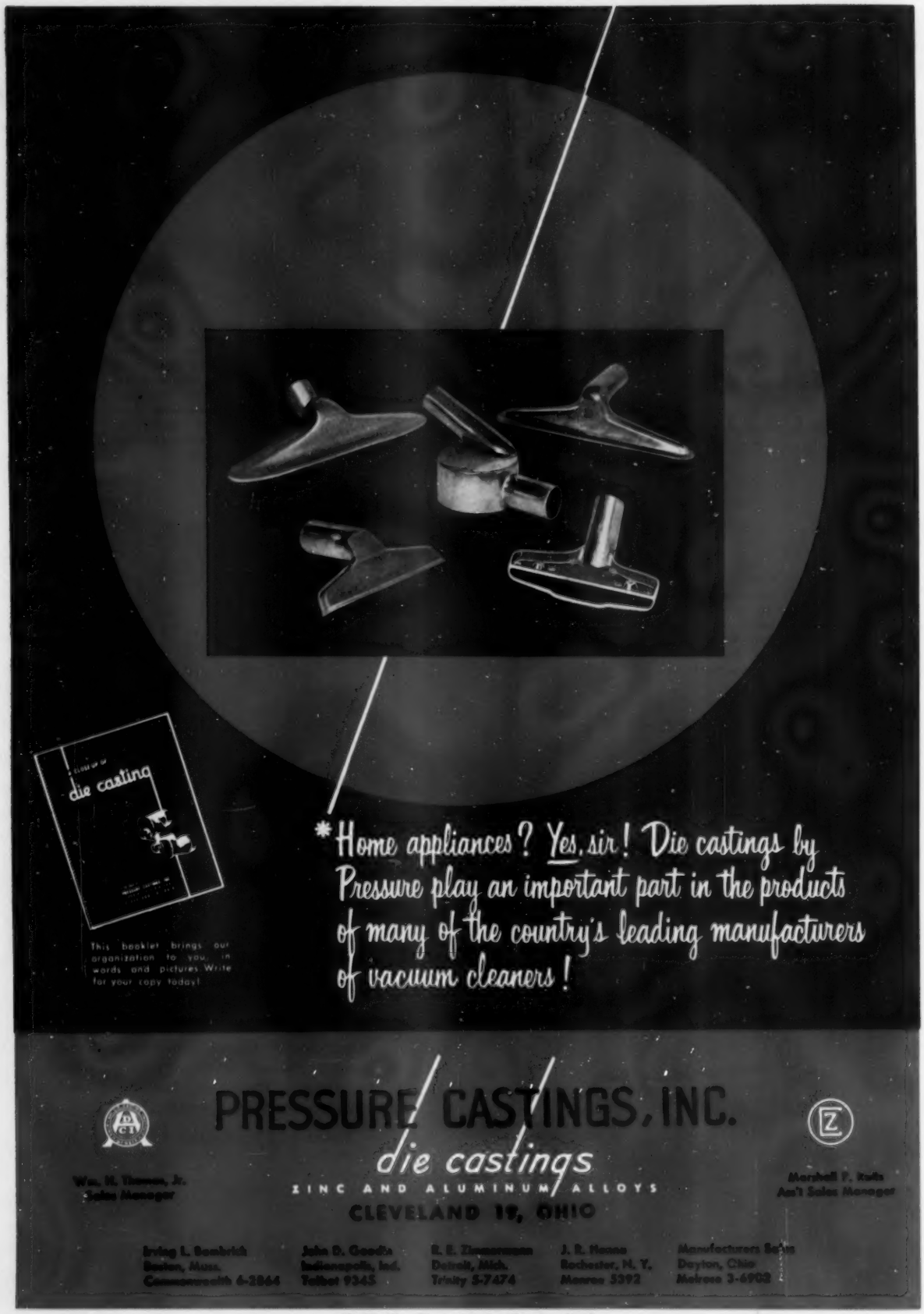

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JULY 1954
Vol. 12 No. 7

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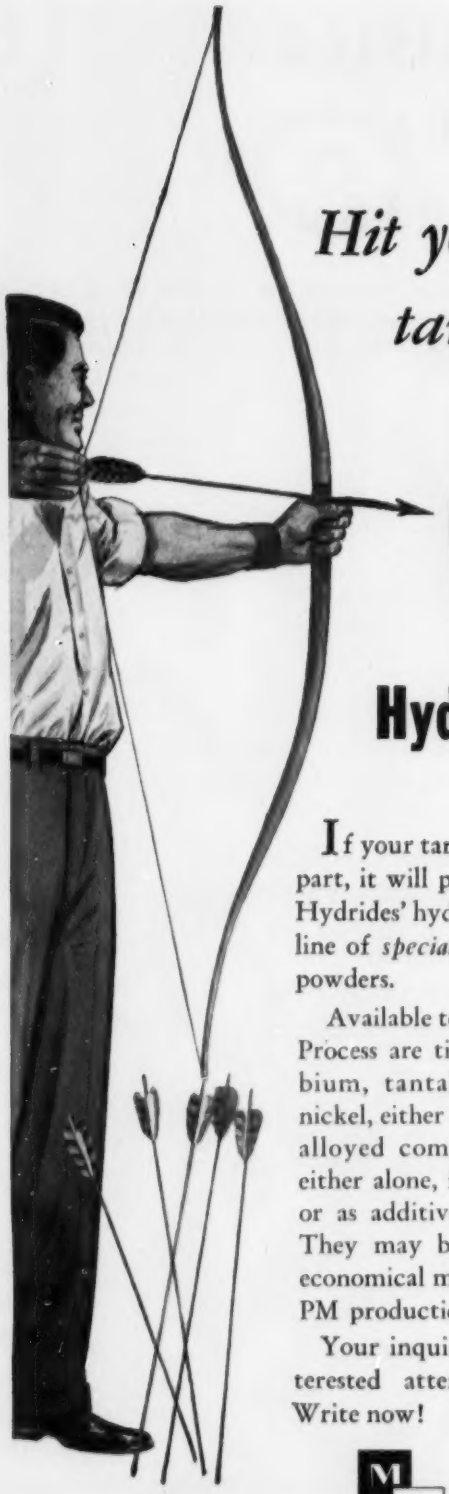
Published monthly by the TECHNICAL PUBLISHING COMPANY, an affiliate of INDUSTRIAL PUBLISHING COMPANY, publishers of APPLIED HYDRAULICS, FLOW, INDUSTRY & WELDING, OCCUPATIONAL HAZARDS, COMMERCIAL REFRIGERATION AND AIR CONDITIONING. Member Business Publications Audit, Inc. Not responsible for unsolicited editorial

Subscription rates: United States and possessions — $3.00 per year; $5.00 for 2 years; Canada — $4.00 per year; $6.00 for 2 years; Foreign—$5.00 per year. Subscriptions to the United Kingdom £1.10 per annum, payable in Sterling to our London office. Single copy price 50 cents. All subscriptions subject to individual acceptance by the publisher.

Published monthly. Acceptance under Section 34.64 P. L. & R. authorized at Boston Harbor, Mich.



Hit your alloying target with

Hydrimet Alloys

If your target is a *special* metal powder part, it will pay you to investigate Metal Hydrides' hydrimet alloys . . . an extensive line of *special* pure or pre-alloyed metal powders.

Available to you through the Hydrimet Process are titanium, zirconium, columbium, tantalum, cobalt, chrome and nickel, either as pure metals or in any pre-alloyed combinations. Evaluate them either alone, in pure or pre-alloyed form or as additives to other metal powders. They may be the fastest, easiest, most economical means with which to hit your PM production target!

Your inquiry will receive prompt, interested attention without obligation. Write now!

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Letters to the editor

BERYLLIUM COPPER CASTING

We would be extremely grateful if you could announce in your letter column that we should like to obtain a list of manufacturers of vacuum precision casting equipment for use with BERYLLIUM COPPER. — T.W.B. (Manager & Director).

Names of suppliers of this type of equipment have been forwarded. — Ed.

SOURCES

Would you, at your earliest opportunity, forward to my attention a list of five or six sources of supply of shell mold castings and plaster mold castings, particularly in the midwestern area. If none is available within this area, please list anything east of Kansas City. — J.O.W. (Purchasing Department).

Do you have available a complete list of all companies in the Eastern part of the United States who are doing Shell Molding in both ferrous and non-ferrous alloys on a contract basis?

If you have such a list, and a copy can be made available to the writer, it will be greatly appreciated. — E.S.H.

Do you know of any books or literature on shell molding, giving detailed instructions about this process?

If you do, will sure appreciate if you will give me information about where I can get such literature. — W.E.P.

I am much interested in doing some plaster mold casting of aluminum and brass. Would you please refer me to some literature on the details of type of plaster, how to mix, how to dry, etc.

Continued on page 12

for Quality Production

AMERICAN ELECTROLYTIC

99.99+% SLAB ZINC

A reliable source for die casting requirements

AMERICAN ZINC SALES COMPANY

Distributors for

American Zinc, Lead & Smelting Company

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When Pressure replaced Gravity

DIE CASTING WAS BORN

Early Die Casting Machine in Operation

The production of castings by pouring molten metal into sand molds is an ancient art. The jewelry industry's requirements for smoother castings with sharper outlines, resulted in the development of a process utilizing plaster molds. In either case, however, the removal of the cast part necessitated the destruction of the mold. The search for a permanent mold for the quantity production of repetitive parts bore fruit in the Middle Ages when manufacturers of pewterware developed molds made of iron. In the 1800's so-called tin soldiers were also gravity-cast from hinged iron molds.

The next logical step was to improve the accuracy of cast parts by forcing molten metal under pressure into strong steel molds, instead of merely relying on gravity. This eventually led to the development of the linotype machine by Ottmar Mergenthaler. The basic principle of the linotype machine — pumping metal into a permanent mold by means of a plunger submerged in liquid metal — was adapted and embodied in the first die casting machine at the start of the century, and the first commercial die castings, such as automotive bearings, were produced from tin and lead-base alloys.

When early die casting experimenters — called upon for castings with better mechanical properties — turned to zinc as a base metal, little did they realize that zinc base die castings would finally advance to a point where they became a vital factor in modern engineering processing. Least of all would these pioneer die casters have foreseen that in a relatively short span of years their infant-industry would be outranked only by the galvanizing industry as the country's largest consumer of zinc.

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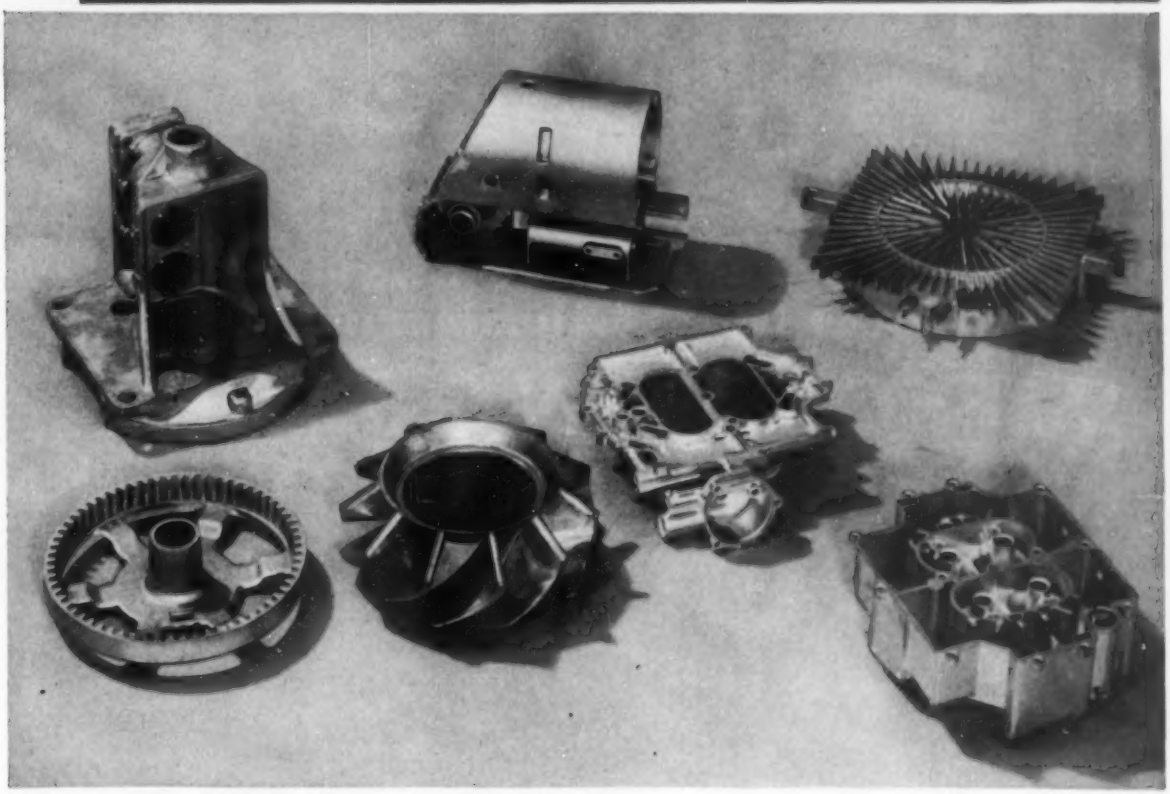

FUNCTIONAL PARTS

More and more, industry is turning to die cast functional parts. In practically every case, Precision die castings offer substantial savings in producing such parts. Manufacturers in the automotive, appliance, tool and machinery industries have realized substantial savings by turning to die cast functional components.

Today's modern alloys plus Precision superior engineering ability can offer YOU substantial savings in the cost of your component parts.

Write for complete information TODAY!

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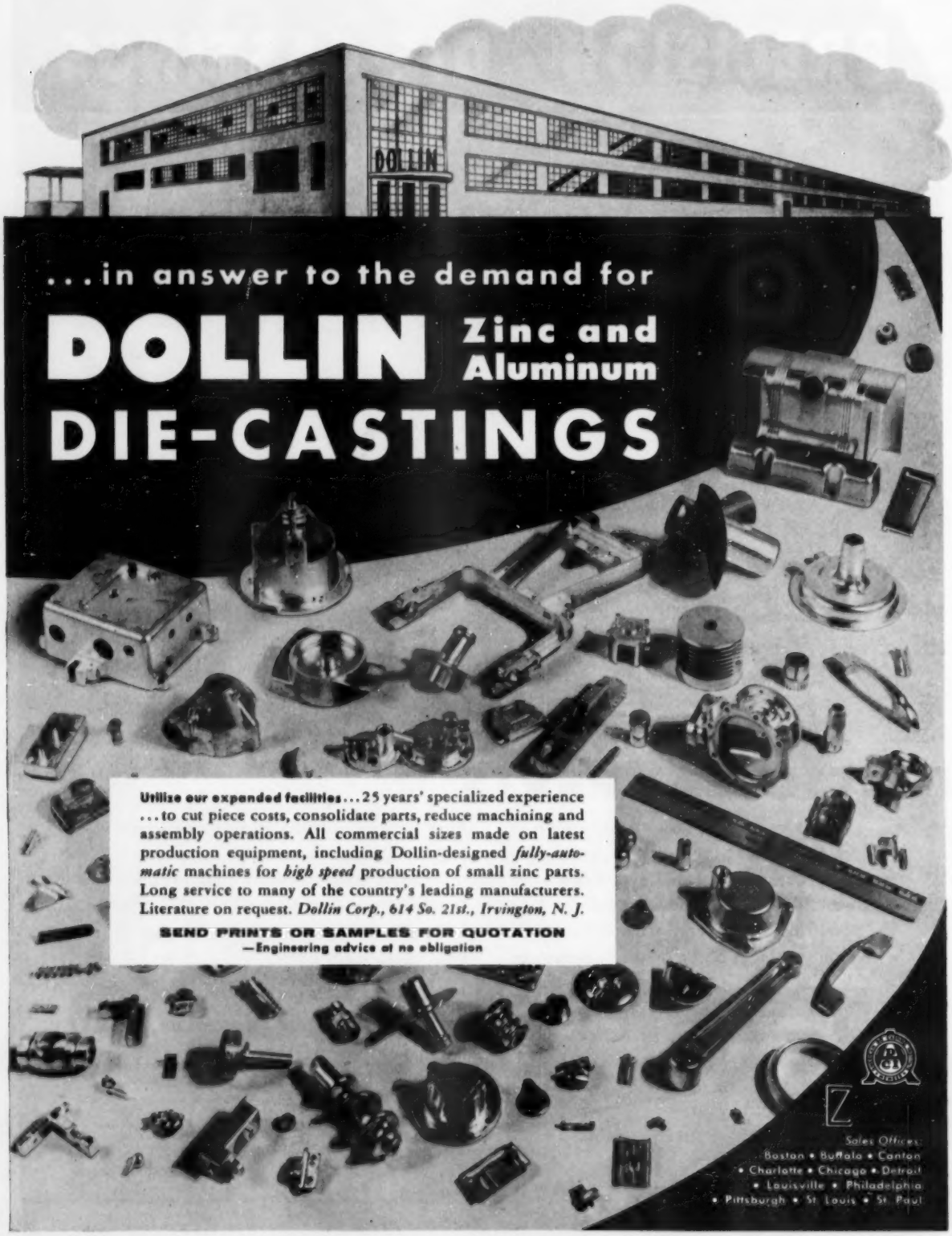
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...in answer to the demand for
DOLLIN Zinc and Aluminum
DIE-CASTINGS
Utilize our expanded facilities... 25 years' specialized experience ... to cut piece costs, consolidate parts, reduce machining and assembly operations. All commercial sizes made on latest production equipment, including Dollin-designed *fully-automatic* machines for *high speed* production of small zinc parts. Long service to many of the country's leading manufacturers. Literature on request. *Dollin Corp., 614 So. 21st., Irvington, N. J.*
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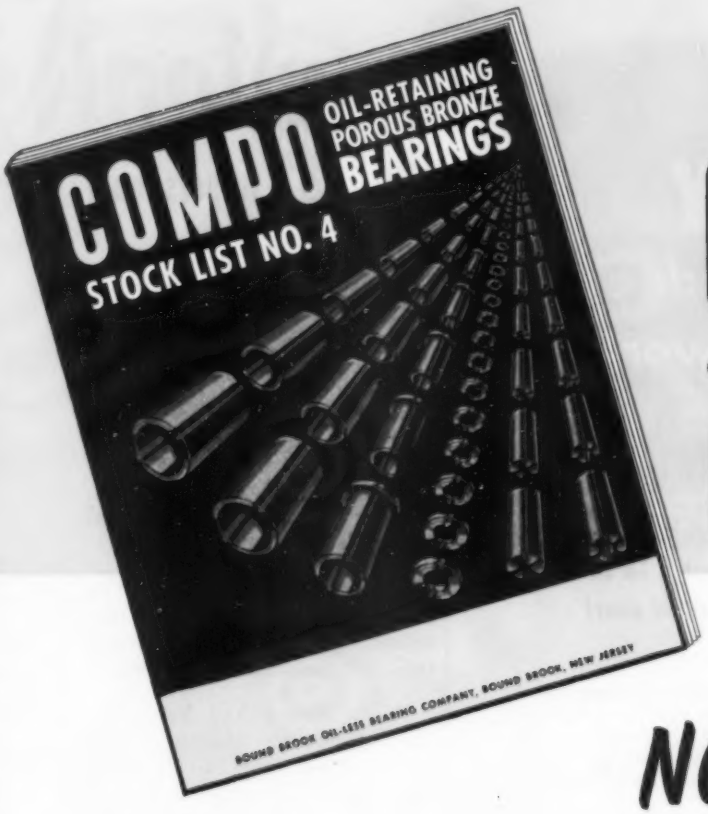

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OIL-RETAINING POROUS BRONZE BEARING

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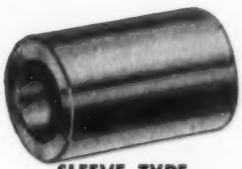


SLEEVE TYPE

FLANGE TYPE

BAR STOCK

CORED BAR STOCK

WASHERS

If you play a part in the design, production or maintenance of equipment using sintered bronze bearings, or if the job of purchasing bearings falls within your domain, you'll find a wealth of useful information within the 20 pages of the new Compo Oil-Retaining Porous Bronze Bearing Stock List No. 4. Bound Brook has compiled an easy-to-read list of the most popular stock sizes of bearings which are available for immediate shipment. In addition the Compo Stock List Brings you up-to-the-minute data on bearing application, installation, lubrication and machining. And here's another thought! When requesting your copy of the Compo Stock List why not have us send one to your supplier of bearing-using components or equipment? It may enable him to make savings beneficial to you both.

Write for a list of location of local warehouse stocks.

4

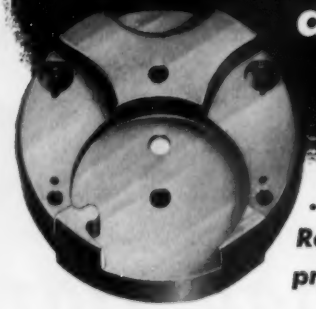
BOUND BROOK

BOUND BROOK OIL-LESS BEARING CO., EST. 1883, BOUND BROOK, N. J.

Pioneer in

POWDER METALLURGY BEARINGS & PARTS

here's how TWIN CITY made $1 do the work of $14



...by casting this Ammunition Rotor Housing at 1/14 of the previous fabricated cost!

Machined from brass in 1943, this rotor housing cost 14 times its present delivery price. Costs had to come down and production had to go up. Could die casting do the job? Several die casters said the small holes in the intricate housing made the job impractical. Costly machining *appeared* to be the only process.

HERE'S WHAT THE JOB INVOLVED:

Cast the rotor housing with a diameter of 1.307″-1.310″, a thickness of .486″ and with eleven cored holes in the casting, some as small as .040″. Four .0780″-.0790″ dia. holes and 2 holes .0945″-.0955″ were included. Counterbore cores were necessary. Tolerances had to be maintained and each hole had to be relative to every other point . . . a most exacting job with 41 separate gauging operations.

HERE'S HOW TWIN CITY HANDLED IT:

The die was made in Twin City's own shop. Special tooling was designed to insure uniformity of subsequent impressions. During casting, temperature of the dies was automatically controlled. Millions of rotor housings have been produced *to specifications* at approximately 1/14 of the machined cost at today's prices. Only in a shop where individual attention is given can a job of this kind be successful.

HOW TWIN CITY CAN CUT YOUR COSTS:

Twin City's experience on countless tough jobs, plus its ability and willingness to work with your engineers can help you show *new* profits on the products you make and sell. Oldest die casters in the Upper Midwest, Twin City welcomes the opportunity to show you how precision die casting can pay off for you.

Write for facts or send sample or blueprint. Let Twin City demonstrate its service plus to you!

TWIN CITY DIE CASTINGS CO.

3351 TALMAGE AVE. S.E. • MINNEAPOLIS 14, MINN.

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Changes in personnel

Austin Ford Logan, Inc. Buffalo, N.Y. has been named an authorized distributor for *Carboloy Dept. of General Electric Co.*

Donald A. Harston has been appointed district sales representative of *American Silver Co., Inc.* for the northern Ohio and northwestern Pennsylvania.

Fullerton Steel & Wire Co. has been named midwest distributor of magnesium mill products for the *Dow Chemical Co.*

R. A. Kimes has been appointed director of engineering of the *American Machine & Foundry Co., Electronics Div.*

J. A. Ogle has been appointed sales representative for the state of Washington by *Precision Castparts Corp.*

R. L. Springfield of the Gay Sales Co. has been appointed sales representative in the Gulfcoast area for *Claud S. Gordon Co.*

Frederick S. Greenawald is the new supervisor of the customer service laboratory of the *Metals Disintegrating Co.*

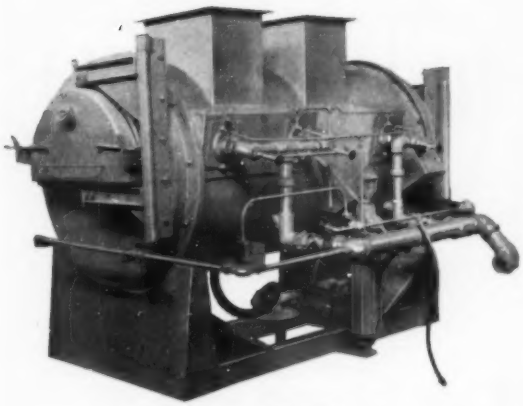
William E. Dorney and **Walter S. Heffron** have been named new fields engineers in the Chicago territory by *Yale & Towne Mfg. Co., Powdered Metal Products Div.*

James B. Hatch has been named sales engineer for the *Industrial Chemicals Div., American Cyanamid Co.*

Harold Higinbotham, member of the board of directors of *Acheson Colloids, Ltd.,* London will tour all American operations of the parent company, *Acheson Industries, Inc.*

Continued on page 20

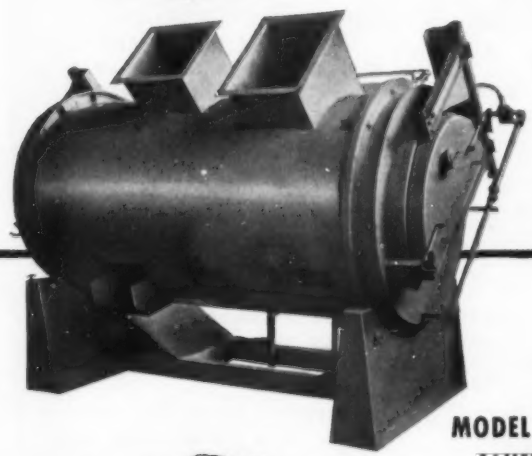
Another Stroman 1st

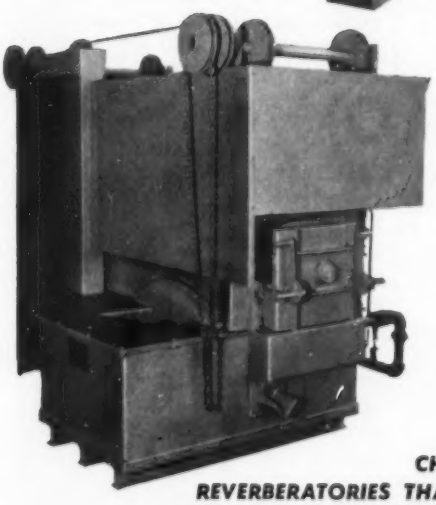


THE FAMOUS MODEL "DC" ALUMINUM
REVERBERATORY FURNACE NOW AVAILABLE WITH...

Pneumatic Tilt Operation

Stroman again sets the pace in the aluminum melting field with their new TILTING TYPE "DC" REVERBERATORY FURNACE for Die Casting, Sand Casting and Permanent Mold plants. Built to specifications that assure perfect metal on every pour, they melt faster, keep metal flowing when you want it . . . are most economical to operate and maintain . . . and assure castings of only the finest quality, which means a minimum of costly rejects. Truly they are the furnaces that can handle any capacity you desire and have metal at correct casting temperature, ready for pouring at all times. Investigate their possibilities in your plant to-day.

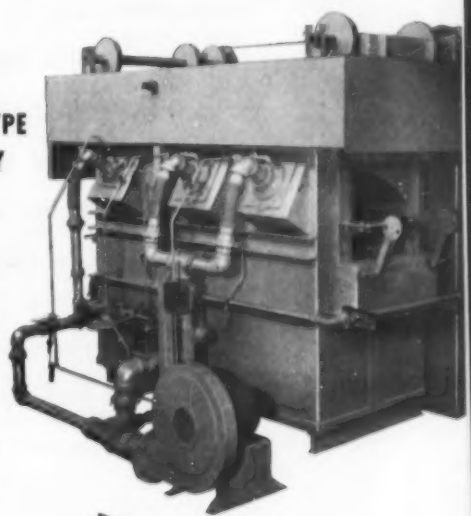




STROMAN

MODEL "DC" STATIONARY TYPE ALUMINUM REVERBERATORY MELTING FURNACE

The original 2 in 1 furnace for breakdown and holding in the same unit. Cold metal never reaches the molten bath. Assures metal of finest quality on all classes of work. Close temperature control. Can be used as a sweat furnace for reclaiming inserts. Is also ideal for all types of plants as tilting model above. Capacities from 350 lbs. aluminum up. Either type furnace may be fired by gas or oil, or combination gas-oil burners.



CHECK ON THESE GREAT STROMAN REVERBERATORIES THAT ARE THE ZENITH OF EFFICIENT AND ECONOMICAL ALUMINUM MELTING. DO IT TODAY!

Stroman makes all types of furnaces for the melting of brass, bronze, aluminum, magnesium, zinc, grey iron and all types of non-ferrous metals. Write for complete catalogue today.

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Ethyl Silicate made by Monsanto Chemicals Limited.

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Monsanto's Ethyl Silicate, which is sold under the trade name SILESTER O, contains a minimum of 40% Silica ; is very widely used as bonding agent for the fillers in the production of moulds for precision investment casting.

From New York warehouse, delivery is prompt and dependable. Further warehousing facilities will be arranged as necessary to ensure best delivery.

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LETTERS TO THE EDITOR
continued from page 4

Although I am not a subscriber to your magazine, I read it in the library of the plant where I work. — J.R.W.

Would you be so kind as to advise us the exact mailing address of the Investment Casting Institute in Chicago. — B.W.

In your January 1954 issue of "Precision Metal Molding" is an article entitled "Metallic Sealing Compounds Can Be Used for Production Impregnation."

Would you please send us a reprint of this article or tear sheets and also the address of the Tincher Products Company so that we may obtain additional data of the process. — F.J.K.

We would like to know the manufacturers of cast aluminum foot valves used on irrigation pumping equipment. Any information you can give us in regard to this will be appreciated. — M.W.L. (Agricultural Engineer).

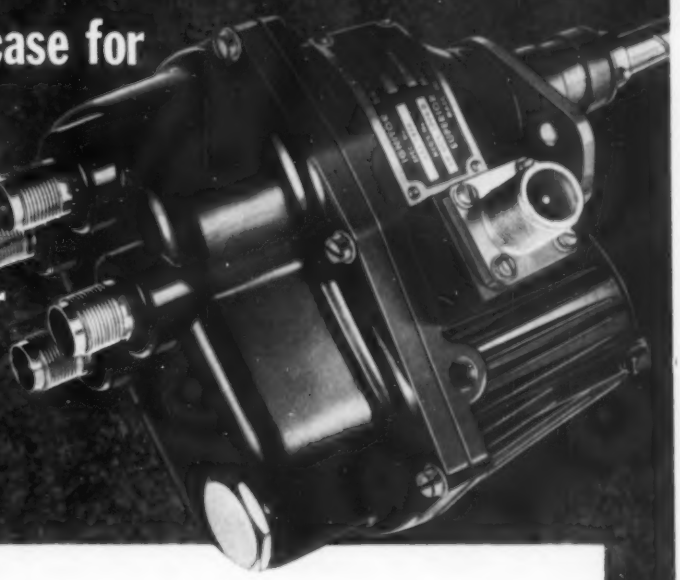
Wherever possible, we are glad to send out available information on sources of supply or other information. — Ed.

SINTERING PROCESS

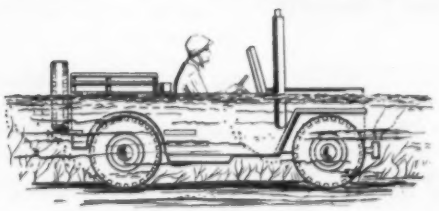
Mr. P. R. Kalischer's article "The Sintering Process. II. Furnaces" published in PRECISION METAL MOLDING, v. 11, Nov. 1953, p. 44-46, 76-80 is of interest to us and we would appreciate having a copy in our Technical Library. Will you please send us this issue of the Journal, together with your invoice for the charges. If it isn't available, we would appreciate receiving word to that effect from you.—A.O.L.

Back issues or tear sheets of articles are available upon request as long as our supply lasts. Single copies or tear sheets are sent without charge, although a nominal charge must be made for larger shipments. — Ed.

Here's a watertight case for DIE CASTING ...in this underwater ignition housing



CASE HISTORIES FROM MT. VERNON FILES

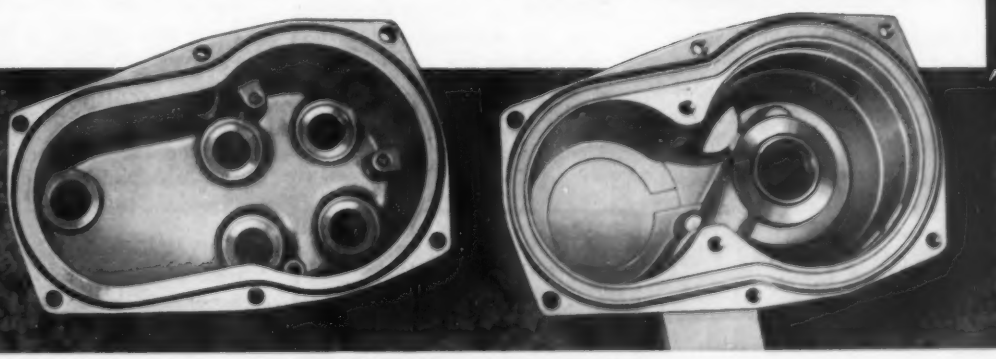


This is a waterproof "Ignitor"—a distributor and ignition coil combined in one case—for a motor vehicle which must operate at times under water. Searching for the *best* way to produce the intricate housing which must keep its contents bone-dry under pressure, the makers, Superior Magneto Corp., Long Island City, N. Y., chose a 2-piece case die cast in aluminum by Mt. Vernon.

Says Superior Magneto: "With die casting we get light weight, with thin walls of great strength and uniform density, able to stand a 300-hour 2½ G. vibration test. With a minimum of machining, dimensional stability is so good the parts are interchangeable, with no need for hand fitting. Both the brass bushings for spark-plug wires and the steel drive-shaft bushing are integrally cast —and they're tight enough to keep out water under pressure. Finally, the finish of the castings is so good, we apply the protective coating directly, without sand blasting or cleaning. All these add up to a fine product, economically made."

Whatever your product, whether simple or intricate, consult with us. We have 162,000 sq. ft. of facilities for die casting aluminum and zinc, and a vast reservoir of experience in die making. Perhaps we can help you, as we helped Superior Magneto, to lower unit costs . . . show you the way to improved products, too.

MT. VERNON
DIE CASTING CORP.
STAMFORD, CONNECTICUT



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Reference Data offered in this month's advertisements

1. DRY FILM LUBES—their advantages in the die casting of zinc and aluminum are discussed in a bulletin from Acheson Colloids.

2. METAL MELTING EQUIPMENT—by Ajax Engineering Corp. is described in literature available from the company.

3. DIE CASTING ALLOYS — their compositions and physical properties are given in a bulletin available from Aluminum Smelting & Refining Co. and Certified Alloys.

4. ALUMINUM SMELTING INDUSTRY — a reprint of a recent article about this industry and its products can be secured from the Aluminum Smelters Research Institute.

5. CASTING ALLOYS — An informative booklet giving the composition, properties, and other information about the alloys prepared by Apex Smelting Co. is now available.

7. INDUSTRIAL PISTON RINGS — Auto-Diesel Piston Ring Co. has available complete information on the sizes, styles, etc. of piston rings for die casting machines and other industrial equipment.

9. INVESTMENT CASTING—Alloy Selection and Design for Precision Casting is the booklet offered by Arwood Precision Casting Corp.

14. COMPLETE LIST of more than 600 most widely used sizes of porous bronze bearings are listed in new edition of Bound Brook "Compo" bearings stock list.

15. CUSTOM-MADE ALLOYS available from Cannon Muskegon Corp. are subject of a technical bulletin the company is offering.

16. DIE CASTING MACHINES — a complete catalog of the die casting machines and machine accessories made by the company is available from Cast-Master, Inc.

18. DIE CASTING INFORMATION—how, when and where to use die castings and the facilities of the company to produce them are given in literature available from the Dollin Corp.

19. INVESTMENT CASTING ALLOYS —the composition and physicals of standard and special alloys available are listed in data sheets from Charles Dreifus.

23. SMALL DIE CASTINGS — the unique facilities of the Gries Reproducer Corp. to produce large quantities of very small die castings are described in a bulletin.

24. THE HENNING MESSENGER — brings information every month about the alloys the company produces and news about the company.

25. INVESTMENT CASTING APPLICATIONS—a booklet describing many new applications has been prepared by the Hitchiner Mfg. Co., Inc.

27. A CATALOG of die casting machines, particularly high speed all-hydraulic models, is available from the Hydraulic Press Mfg. Co. It is catalog 5105-A.

30. SOLVING PRODUCTION PROBLEMS through the use of investment castings is the subject of a booklet put out by International Nickel Co.

33. DIE CASTING MACHINE catalog listing available sizes and types as well as operating data, is ready for distribution from Lewis Welding & Engineering.

34. DESIGNING FOR DIE CASTING in light metals is covered in a booklet from Litemetal Dicast.

36. PERMANENT MOLD CASTINGS — their design and production are discussed in a brochure from Mansfield Brass & Aluminum.

39. INVESTMENT BONDING MATERIALS—data sheets on the properties and uses of ethyl silicate in the investment casting field are available from Monsanto Chemicals, Ltd.

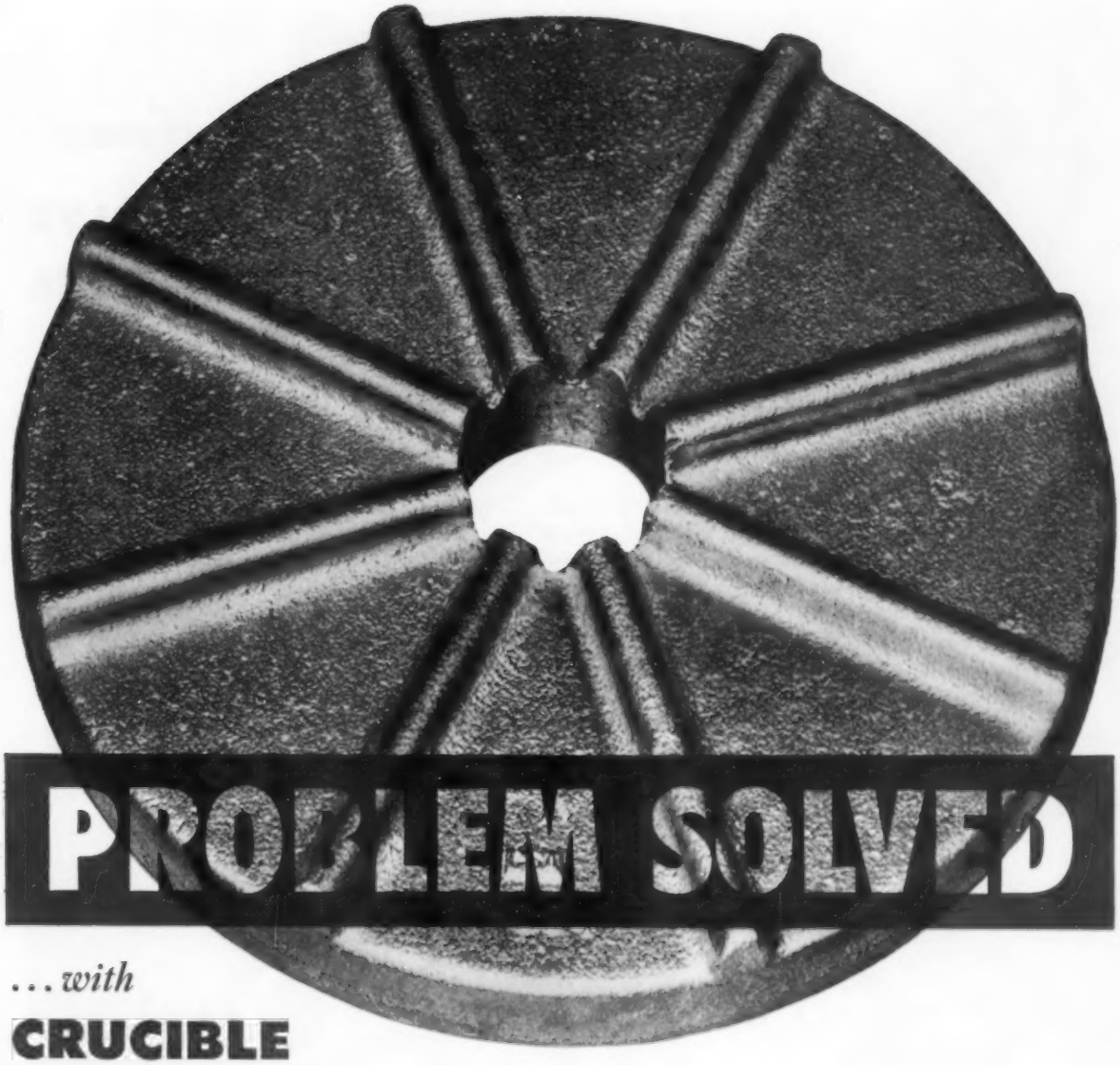
43. PLASTER MOLD CASTINGS—a brochure giving a group of typical case histories of the application of plaster mold castings has been published by Ohio Precision Castings, Inc.

48. THE FACILITIES and experience of the company in producing die castings are described and illustrated in a booklet from Pressure Castings, Inc.

49. DIE CASTING TO SPECS—a description of the facilities and experience in meeting customer

Continued on page 18

To get copies of any item listed here, simply circle the appropriate number on the Reader Service Card bound into this issue.



. . . with

CRUCIBLE

stainless steel castings

A large shell manufacturer had a serious problem. Cast iron shell holders, used in the hardening furnaces where temperatures go up to 1600 F, burned out and crumbled. Frequent replacements and costly shutdowns were necessary.

The casting shown above (Crucible Type 309) proved the answer to the problem. This sand casting of heat-resistant stainless steel, and hundreds like it, are outperforming their iron predecessors . . . and seem headed for a practically limitless life.

It will pay you, too, to take full advantage of Crucible castings. They are available in a wide range of stainless, tool and special alloy grades, and to meet conditions of corrosion, high-temperature, wear or abrasion. And Crucible—leading producer of special steels—controls the steel used, from furnace to finished casting. You can be sure of sound, uniform castings of the highest quality when you *call Crucible.*

54 *years of Fine steelmaking*

CRUCIBLE first name in special purpose steels

STAINLESS CASTINGS

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • MAX-EL • ALLOY • SPECIAL PURPOSE STEELS

Circle No. 72 on Reader Service Card

Bendix-Westinghouse

OFFERS NEW BRAKE VALVE FOR LIGHT VEHICLES

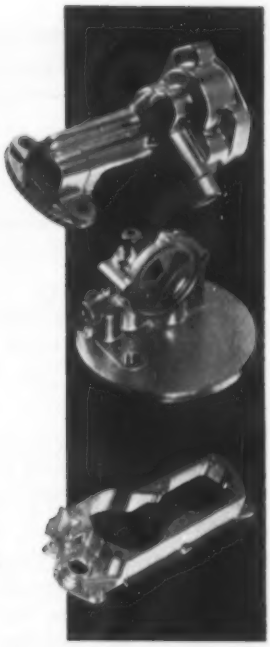
. . . The housing is a Parker Die Casting

THE new Bendix-Westinghouse Type "E" Brake Valve, specifically designed for light weight vehicle installations, has ample capacity to provide truly modern air brake control. Its treadle brake control is preferred by the vast majority of drivers. The valve housing is a Parker Die Casting. Original equipment manufacturers in nearly every industry have found that Parker Die Castings practically eliminate machining costs and materially reduce weight without loss of strength. You, too, may realize the benefits of die castings in your product. Consult with Parker today.

and when you think of Die Castings THINK OF

PARKER WHITE-METAL COMPANY • 2153 McKinley Ave., Erie, Pa.

PARKER ALUMINUM and ZINC Die Castings



. . . THERE'S MORE TO PRODUCTION DIE CASTING THAN MEETS THE EYE!

Only the LEWIS 650-B die-forge casting machine features injection pressures up to 100,000 pounds and the exclusive new 650-ton "HYDRA-LOCK" clamping mechanism.

"HYDRA-LOCK" assures maximum safety and prevents "spitting". Its design also provides for faster, easier die setting through a ball-and-socket action that compensates for misalignment of die faces within reasonable limits. Both final squeeze pressures and injection speeds are variable to meet individual job requirements.

Model 650-B is engineered to mass produce, with minimum scrap, high-strength low-cost aluminum and magnesium alloy parts weighing up to 9.5 pounds. Large platens . . . high-speed 2-stage injection . . . fingertip controls . . . and a remote power source for flexibility of installation combine to create a superior die casting unit.

Write for Catalog 103 today

1967-LW

MODEL 650-B

Safest, most powerful mold clamping device available today, "HYDRA-LOCK" utilizes a large-diameter short-stroke hydraulic cylinder to develop final closing and locking pressures up to 650-tons. Because of short stroke, only tenths of a second and a cupful of oil are required to accomplish final closing.

LEWIS

THE LEWIS WELDING AND ENGINEERING CORPORATION
63 INTERSTATE STREET • BEDFORD, OHIO

Circle No. 33 on Reader Service Card

REFERENCE DATA
continued from page 14

demands is contained in a brochure from Racine Die Casting.

57. BARREL FINISHING—a description of the self contained, controlled speed, barrel finisher is available from the Abbott Ball Co.

58. ENGINEERING DATA and specifications on Iridite finishing can be secured from Allied Research Products, Inc.

60. SELENIUM RECTIFIERS for all finishing operations requiring a D. C. source are described in a catalog from Bart-Messing, Corp.

61. LAPPING & FINISHING problems are analyzed and methods described in a 36-page booklet from The Carborundum Co.

65. AUTOMATIC DEBURRING—details on the automatic hole deburring equipment manufactured by Nobur Mfg. Co. is available.

66. POLISHING WHEELS & BELTS—information on setting up polishing wheels and belts as well as helpful suggestions on polishing different metals is contained in a booklet available from the Norton Co.

67. ZINC PHOSPHATE COATINGS on steel, methods and supplies are discussed in a booklet from Oakite Products, Inc.

68. LENGTHEN DIE LIFE by finishing dies with Hydro-Finish. Descriptive information on this procedure is available from the Pangborn Corp.

26. DIE CASTING is the title of an informative brochure offered by the die casting division of the Hoover Company.

31. HIGH PRESSURE PUMPS are discussed in a technical brochure from Kobe.

32. DIE CASTING MACHINE catalog presenting a full range of machine capacities, is available from Kux Machine Co.

53. NON-FERROUS MELTING furnaces are described and illustrated in the catalog from Stroman Furnace giving specs on their equipment for melting zinc, aluminum, magnesium, copper-base alloys and gray iron.

54. PRICE LIST of silicas specially prepared for investment casting, is offered by Tamms Industries. Included are amorphous, crystalline and diatomaceous silica.

63. PLATING SPECIALISTS who have a brochure to show their large plant for electroplating die castings, as well as other finishing operations, are the Four Plating Company. The company's extensive automatic equipment for job plating is illustrated.

Die Castings by MILWAUKEE

...for Extra Values at No Extra Cost!

A pioneer in its field, Milwaukee offers you the experience and knowledge gained in helping others for more than 40 years, to realize the full benefits of the die casting process. In its modern plant, it offers you the most advanced facilities for the production of zinc and aluminum die castings. These extra values which cost you no more, can help you build extra values into your product, too.

We operate under the Certified Zinc Plan of the American Die Casting Institute, Inc.

MILWAUKEE DIE CASTING COMPANY
4146 N. HOLTON STREET • MILWAUKEE 12, WISCONSIN
Established 1909

Circle No. 38 on Reader Service Card

YOUR "ALL-IN-ONE" SOURCE for PERMANENT MOLD CASTINGS in ALUMINUM

We offer complete service on aluminum permanent mold castings. We also have complete foundry facilities for sand casting aluminum, brass and bronze.

Heat Treating Facilities for Aluminum Alloys

Design assistance or consulting engineering service on your casting problems.

Write for information, or send your prints for quotations

Mansfield Brass & Aluminum Corporation
MANSFIELD • OHIO

Circle No. 36 on Reader Service Card

REFERENCE DATA FROM THE FOUNDRY SHOW

As a service for those who could not attend the show, here's some of the reference material that was offered concerning precision casting processes. For your copy, circle the appropriate number on the Reader Service Card.

Permanent Mold Casting Alloy: **118**
American Alloys Corp. has a four page brochure describing the aluminum-magnesium-titanium casting alloys prepared by that company.

Ladles & Crucibles: **119**
The line of pouring ladles and crucibles, both holding and pouring, available from American Tank & Fabricating Co. are described in two information bulletins, Nos. PM 100 and S-H 110.

Shell Molding: **120**
The Arrow Pattern & Engineering Co. has a brochure describing the Arrow shell pour off system.

Shell Molding Resins: **121**
Booklets on the shell molding process and on shell mold resins are available from the Bakelite Co., Div. of Union Carbide & Carbon Corp.

Shell Mold Machines: **122**
A descriptive sheet about the Beardsley & Piper mold making machine is available.

Castings by Shell Mold Process: **123**
Literature on castings made in bronze or aluminum by the shell mold process is available from R. B. Carolin Foundry & Machine Co.

Centrifugal Casting: **124**
The advantages and uses of centrifugal casting in the investment casting foundry are described in a four-page brochure and a collection of reprints available from the Centrifugal Casting Machine Co.

Shell Molding Machine: **125**
A semi-automatic machine for making shell molds is illustrated and described in a folder from the Centrifugal Casting Machine Co.

Arc Melting Furnaces: **126**
Furnaces for the indirect arc melting of small batches of metal are illustrated and described in literature from Detroit Electric Furnace Div. of Kuhlman Electric Co.

Silicones: **127**
Silicones for a wide variety of uses in and around the foundry are listed and described in a group of data sheets from the Dow Corning Corp.

Shell Molding Resins: **128**
Durez Plastics & Chemicals, Inc. has available several informative brochures on the shell molding process and shell molding resins.

Gamma Ray Inspection: **129**
The use of radioactive isotopes for Gamma Ray inspection is fully described in a brochure from Gamma Ray Industries, Inc.

More About Silicones: **130**
A group of booklets and descriptive leaflets describing the various silicones and their uses are available from Linde Air Products Co. Div. of Union Carbide & Carbon Corp.

Production and Maintenance: **131**
A complete 64-page catalog and separate catalog sheets on rotary burrs, files, hand mills, saws, and electrical maintenance equipment are available from Martindale Electric Co.

Casting Impregnating Unit: **132**
Impregnating equipment and supplies are described in a bulletin from the Metallizing Company of America.

Primary Aluminum and Alloys **133**
The wide range of pig and alloy ingot available from Reynolds Metals Co. is listed in a brochure.

Shell Making Machine: **134**
A completely integrated machine for making shell molds is described and illustrated in a leaflet from Shell-O-Matic, Inc.

Shell Mold Making: **135**
Equipment for making molds for shell mold casting is fully described in a bulletin from Shell Process, Inc.

Shell Mold Foundry Equipment: **136**
Shallway Corp. have literature available on their equipment for making shell molds for large and small foundries.

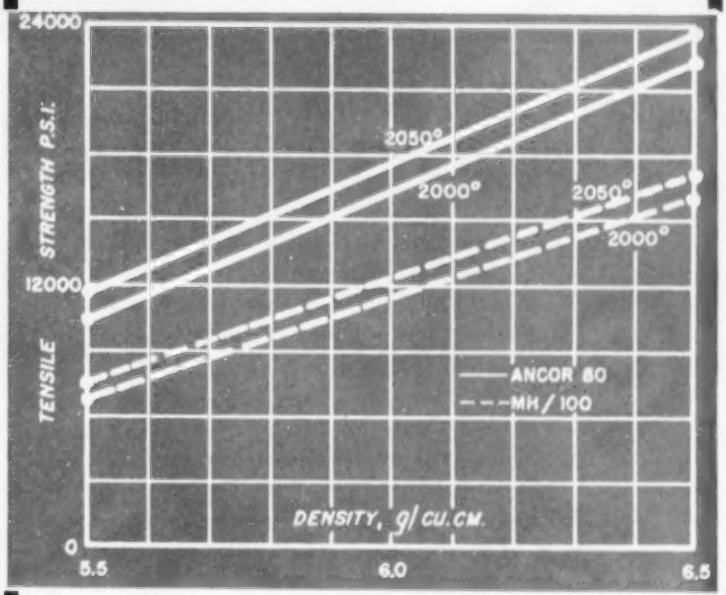
Shell Molds: **137**
Southern Shell Mold Equipment Co. have a descriptive folder describing their mold making machines as well as a reprint of an article describing the process.

Machines for Shell Molding: **138**
Automatic, semi-automatic and manual machines for making shell molds are described in a bulletin from Tyler Metal Products Co.

The Use of Plaster in Industry: **139**
The U.S. Gypsum Co. have six bulletins available describing the many uses of Hydrocals in industry.

HOEGANAES
Sponge Iron Powder

The increased green strength of the American produced Ancor 80 quality widens the range of parts that can be economically produced.



Sintered tensile strength of Ancor 80 VS MH/100. In each case, the mix contained 1% zinc stearate only.

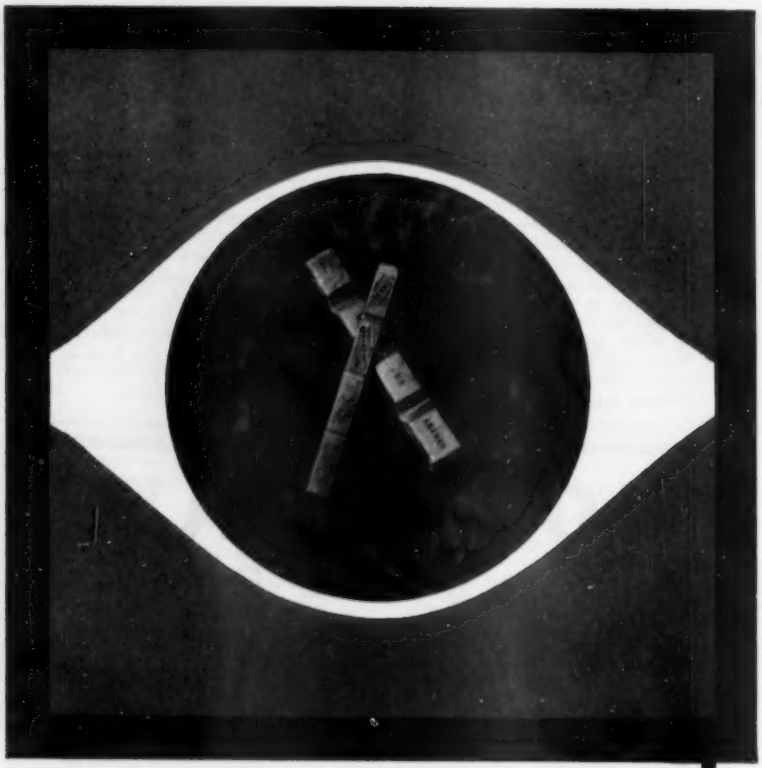
Call in Your Powder Metallurgy Fabricator For Design Consultation

MEMBER mpa METAL POWDER ASSOCIATION

EKSTRAND & THOLAND
441 LEXINGTON AVENUE
NEW YORK 17, NEW YORK

Sellers of Hoeganaes sponge iron powder

Circle No. 20 on Reader Service Card



Let's look at the facts about die casting metals

Most people claim aluminum and zinc die cast alloys are pretty much the same wherever you buy them. Maybe. But that's not the point.

You want more than the *product* when you buy metal. You want *service* from your supplier.

Federated service gives you:

1. Research, constantly working to give you a new and better metal.
2. Practical Help, in your shop, by field experts whenever you have a metal problem.
3. Fast Deliveries; 14 plants across the country.
4. Metal Variety; any die casting alloy you need, aluminum, zinc or magnesium.

Try Federated metal-plus-service. It's the best metal plus the extra of competent technical help with your problems.

Federated Metals Division

AMERICAN SMELTING AND REFINING COMPANY
120 BROADWAY, NEW YORK 5, N. Y.
In Canada: Federated Metals Canada, Ltd., Toronto and Montreal

Aluminum, Magnesium, Babbitts, Brass, Bronze, Anodes, Zinc Dust, Die Casting Metals, Lead and Lead Products, Solders, Type Metals

Circle No. 22 on Reader Service Card

CHANGES IN PERSONNEL
continued from page 10

William A. Ross has been appointed sales representative in the metal department of *St. Joseph Lead Co.*

Edwin T. Jackman and **George R. Brotherton** have joined the sales staff of *Vanadium-Alloys Steel Co.*

Two new regional sales managers appointed for the Metals Div., *Olin Industries, Inc.* are **W. L. Ashlock** in New Haven, Conn., and **H. F. Grote** in Cleveland, Ohio.

New technical service representatives for *Oakite Products, Inc.* are: **Malcolm N. Gray** in the Nebraska area; **John N. Lee** in Florida; **Kenneth L. Oliver,** Indiana; **Thomas D. Ellsworth,** Michigan; **D. O. Mundale,** North Carolina; **Haskel Wilder,** Wisconsin; **Lloyd W. Kagley,** Tennessee; **William D. Hudson,** Kansas; and **Henry W. Dieter,** Ohio.

John S. Collbran, Jr. has been named western district sales manager for *New Jersey Zinc Sales Co.*

New appointments announced by *Linde Air Products Co.* are: **Dr. Paul E. Peters,** manager of research laboratories; **Harold V. Mosby,** business manager in charge of all non-technical administrative functions; **A. R. Holmes,** general superintendent of all Linde plants; **Dr. Edward L. McCandless** and **Dr. C. O. Strother,** assistant directors of research; **Richard S. Abrams,** manager of silicone production and development; **Dr. Albert L. Bayes,** manager of silicone sales development.

GRADE A DESIGNING

with MADISON-KIPP

Zinc and Aluminum Die Castings

The die casting here illustrated was formerly made in two parts. Highly qualified designing by the principal and seasoned skill by the die caster were involved to get the spectacular results that are so apparent in this end product.

Grade A die casting designing is often achieved by cooperative effort of product manufacturer and Madison-Kipp

Please write us when you think die castings may apply.

kipp

MADISON-KIPP CORPORATION

213 WAUBESA STREET • MADISON 10, WIS., U.S.A.

• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

Circle No. 35 on Reader Service Card

Names and Trends in Markets • Materials • Applications

RETIREMENT has been announced this month by one of the most active men in the die casting industry. Jeff Rollason, president of the American Die Casting Institute and general manager of Alcoa's die casting operations, is the third ADCI leader to depart from active participation in the industry within the past year. Union Die Casting's J. M. Davis announced retirement and Cleveland Hardware & Forging's Charles Sanford switched to the paper industry. All three men have been leaders in ADCI affairs.

FOUNDRYMAN - CATTLE RAISER Frank Howard Sr. showed a check for the sale of his entire herd of registered Herefords recently. He is replacing his 300 Herefords with a herd of black angus.

UNIQUE METHOD of separating die castings from trimmed flash is used for super-small zinc die castings produced by Gries Reproducer. One small casting that is about the size of a hyphen drawn with 4H pencil, is separated from the flash by flotation in water. The flash sinks, the tiny die castings float off at the surface.

MEDICAL FUND drive in the metal industry will be headed this year by Joseph A. Martino, president of National Lead Company, who has accepted chairmanship of the Metals Division of the Committee of American Industry which will canvas the non-ferrous segment of the metals field in behalf of the National Fund for Medical Education. The CAI is spearheading a nationwide appeal to raise $10,000,000 for the country's 79 medical schools.

One of the major aluminum companies recently pointed out in an advertisement, "The sage who opined in 1920 that castings were on the way out couldn't have been more wrong. As of this date, *over one-fourth of all the aluminum produced winds up in cast form.* Aluminum can now be cast by all processes . . . sand, die, permanent mold, investment, plaster and centrifugal." The advertiser could also have pointed out that the precision casting techniques covered editorially by PMM account for more than two-thirds of all aluminum castings. The ad goes on to state, ". . . many users of castings haven't taken the pains lately to find out exactly what their castings cost them. We don't mean the price from the foundry. We mean the price *as finished* and *assembled* in the product." However, a chart prepared by PMM's market research department shows rapid rise of die and permanent mold casting tonnage, decrease in sand cast tonnage, which indicates growing recognition of *finished piece costs* as a buying guide.

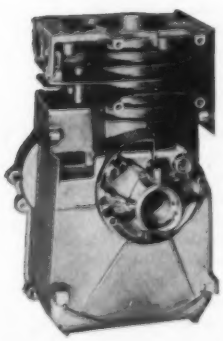
AJAX INDUCTION FURNACES

BRIGGS & STRATTON CORPORATION

More Than
1,000,000 INDUSTRIAL ENGINES
built in each of
Two Successive Years

4 CYCLE
BRIGGS & STRATTON
GASOLINE ENGINES

With holding furnaces of 20 kW similar to that in the photo above, and melting furnaces of 100 kW, Briggs & Stratton Corp., Milwaukee, Wisc., is getting increased production under cleaner, more satisfactory working conditions than ever before, *and at lower operating costs.*



The intricate die-cast aluminum cylinder shown at the left is one of many produced at the B & S plant from high grade aluminum alloy melted in low-frequency AJAX induction furnaces. In these furnaces *only the metal is heated.* Energy is transmitted to the molten charge without actual contact through the refractory walls. There are no resistors or other parts having a higher temperature than is absolutely necessary for properly melting the charge. Overheating is avoided, and there is practically no oxidation.

The holding furnaces next to the die-casting machines as well as the melting furnaces are automatically controlled at a temperature within ±5°F., holding the metal at the lowest feasible casting temperature. The agitation due to internal electrical stirring in the metal gives the best conditions for holding furnaces, and there is little possibility of sludge formation at the bottom, because this is where the heat is generated.

AJAX

Write for Further Information to
AJAX ENGINEERING CORP., TRENTON 7, N. J.

TAMA-WYATT

INDUCTION MELTING FURNACE

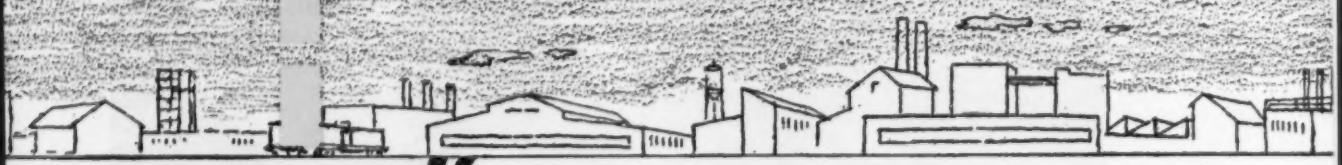
AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

Circle No. 2 on Reader Service Card

THE RIGHT WAY *to quality zinc die castings*

CERTIFIED ZINC ALLOY PLAN
LICENSED PRODUCER
AMERICAN DIE CASTING INSTITUTE

. . . and the way to be certain of "on grade" alloys . . . the CERTIFIED ZINC ALLOY PLAN



You're on sure ground when your die castings are made by a CZ Licensed Producer. No matter what your requirements, the **CZ Alloy Plan,** through constant periodic inspection and testing, guarantees their fulfillment with the proper alloy.

Any of the leading die casting firms listed here, the only licensed **CZ Alloy Plan** producers, will be glad to explain the plan to you or discuss any die casting problem you may have. A free folder, outlining in full the operation of the **CZ Alloy Plan,** will be sent upon request.

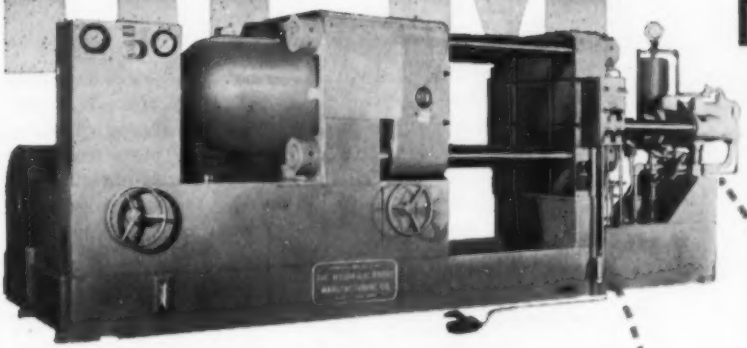
LICENSEES under the CZ ALLOY PLAN

A & A Die Casting Co., West Los Angeles, Calif.
The Accurate Die Casting Co., Cleveland, Ohio
Advance Pressure Castings, Inc., Brooklyn, N. Y.
Advance Tool & Die Casting Company, Milwaukee, Wis.
Badger Die Casting Corp., Milwaukee, Wis.
Central Die Casting & Mfg. Co., Inc., Chicago, Ill.
Cleveland Hardware & Forging Co., Cleveland, Ohio
Congress Drives Division, Tann Corp., Detroit, Mich.
Continental Die Casting Corp.,
Division of F. L. Jdcobs Co., Detroit, Mich.
Crown City Die Casting Co., Pasadena, Calif.
Doehler-Jarvis Division
National Lead Company, Grand Rapids, Mich.
Doehler-Jarvis Division
National Lead Company, Pottstown, Pa.
Doehler-Jarvis Division
National Lead Company, Toledo, Ohio
Dollin Corporation, Irvington, N. J.
Du-Wel Metal Products, Inc., Bangor, Mich.
Federal Die Casting Company, Chicago, Ill.
Globe Imperial Corporation, Rockford, Ill.
C. M. Grey Mfg. Co., East Orange, N. J.
Heick Die Casting Corp., Chicago, Ill.
Hilfinger Corporation, Toledo, Ohio
The Hoover Company, North Canton, Ohio
Kiowa Corporation, Marshalltown, Iowa
Paul Krone Die Casting Co., Chicago, Ill.
Madison-Kipp Corporation, Madison, Wis.
Milwaukee Die Casting Company, Milwaukee, Wis.
Monarch Aluminum Mfg. Co., Cleveland, Ohio
Mt. Vernon Die Casting Corp., Mt. Vernon, N. Y.
Paragon Die Casting Company, Chicago, Ill.
Parker White Metal Co., Erie, Pa.
Precision Castings Company, Inc., Fayetteville, N. Y.
Precision Castings Company, Inc., Cleveland, Ohio
Precision Castings Corp., Chicago, Ill.
Pressure Castings, Inc., Cleveland, Ohio
Racine Die Castings Co., Racine, Wis.
St. Louis Die Casting Corporation, St. Louis, Mo.
Schultz Die Casting Company, Toledo, Ohio
Sterling Die Casting Co., Inc., Brooklyn, N. Y.
Stewart Die Casting Division
of Stewart-Warner Corp., Bridgeport, Conn.
Stewart Die Casting Division
of Stewart-Warner Corp., Chicago, Ill.
Stroh Die Moulded Casting Co., Milwaukee, Wis.
The Superior Die Casting Company, Cleveland, Ohio
The Tool-Die Engineering Co., Cleveland, Ohio
Twin City Die Castings Company, Minneapolis, Minn.
Union Die Casting Co., Ltd., Los Angeles, Calif.
Universal Die Casting Company, Los Angeles, Calif.
Western Die Casting Co., Emeryville, Calif.

AMERICAN DIE CASTING INSTITUTE, INC.

366 MADISON AVENUE NEW YORK 17, N. Y.

HPM

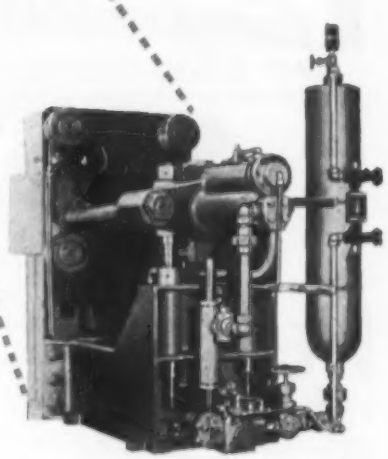


Model 400-B *Aluminum* Die Caster!

with Built-In Nitrogen Accumulator for INCREASED INJECTION SPEED!

for ALL-HYDRAULIC HIGH PRODUCTION of PRECISION PARTS . . .

- Here's a new, high-speed die casting machine for making aluminum castings up to 12 lbs. in weight. Listed below are just a few of the H-P-M design features which make this new die caster second to none:
  - High-speed plunger advance . . . up to 400 ft. per minute.
  - Positive, injection pressure build-up . . . no pre-fill valve to close.
  - Built-in hydraulic ejector saves time, greatly reduces die costs and minimizes operator fatigue.
  - Rugged straight-line "All-Hydraulic" die clamp with few moving parts, assure positive die alignment . . . die change-over is simple and fast.
  - Dual hydro-electric safety devices guard against premature injection.
  - Plenty of space around die mounting surfaces for installation of core pull cylinders.
  - Independent handwheel adjustments for both die clamp and injection pressures.



400 ft. per Minute *Injection Speed*

Write for catalog 5106-A, today.

SPECIFICATIONS MODEL 400-B					
SIZE OF DIE PLATES	SPACE BETWEEN BARS	DIE OPENS	MAXIMUM DIE SPACE	CAPACITY PER SHOT (LBS.)	NET WT. (LBS.)
38"x38"	23"x23"	16"	42"	* 2.2 To 12.2 (Al)*	40,500

*Note: The model 400-B handles brass and magnesium die casting as well. Complete specifications on this and model 150-A (150-Ton) machines on request.

HPM **THE HYDRAULIC PRESS MFG. CO.**

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Between the Lines of this and future issues

A Slice of Meat 0.00000098425" Thick . . .

Some of the sandwiches we have had in restaurants lately have had the meat cut pretty thin, but now we find out there is a machine for slicing material 1/40th of a micron thick. Hope the restauranteurs don't hear about it; it is built for use in pathological laboratories. Sixteen investment castings go into each of these microtomes. Story begins on page 32.

Calling All Brush and Hand Tool Manufacturers . . .

Impressive new use of zinc die castings is for the ferrules on hand tools used in the garden, reported in this issue. We had heard unconfirmed reports that a paint brush manufacturer had been using die cast ferrules similarly to replace sheet steel, but were unable to present the report. It looks to us as though this should be a place for zinc die castings to be much more widely used. See page 31.

Are Your Fastening Methods the Fastest . . . ?

One place that die castings help the designer to pare his product costs is in the assembling department. Not only can die castings be made accurate enough to simplify fastening, but the nature of the metals and the die casting process permit use of faster, simpler and less expensive fastening methods. Fifteen ways to use spring type fasteners are introduced in this issue beginning on page 51.

New Idea for Permanent Mold Casting . . .

The technical literature on the permanent mold casting process is mighty skimpy. Most practitioners of the art have developed their own methods and equipment and have written little about them. We are pleased to add a report in this issue on the use of a new mold material for permanent mold casting, with data on properties of aluminum permanent mold castings so-produced. Turn to page 81.

Here's a Trick Worth Noting . . .

Does it sound feasible to die cast a binder ring for loose leaf notebook? Could such a ring be cast in such a way that it would emerge from the die as a completely assembled, movable unit? How would the cost of such a cast binder ring compare with the conventional method of cutting from wire, machining, forming and assembling? The answer to these questions appears in a report on a practical use of a new die casting technique presented in this issue.

Can You Use Parts Made from Brass Powder . . . ?

Ready for publication in PMM in the near future is a comprehensive report for product designers on the properties of brass powder parts. This is loaded with data to help in planning most effective use of brass powdered metal parts.

Machining time cut 75%

If you could look inside an American Seal Kap milk-bottle capping machine, you would see 6 of these type 302 stainless steel wedges.

Once, each took 13 machining operations to complete (more if you count rough and finish cuts separately).

Now the wedges are precision investment cast by Inco. They take only 9 machining operations...four of them simply light, finish cuts. Net saving in machining time, 75%.

What's more . . . with a slight change in one machining step . . . the machinists adapt a single size Inco casting to any one of 3 wedge sizes. That keeps pattern cost down, of course. It also means that handling takes only one order, one shipment, one stock bin.

What about you? Are you machining parts that could be Inco precision cast for less? Picking out parts where Inco precision castings are likely to save money is not hard . . .

Here's a "rule of thumb" to guide you

Look over the parts you make. Whether plain carbon steel or one of the new super alloys, there's a good chance that Inco precision casting will save money for you when parts are: 6x5 inches or smaller; weigh under 3 lbs.; require starting tolerances as close as 0.005 inch per linear inch; take 5 or more steps to machine.

If you need such parts, you may want to look more closely into Inco precision casting. If so, write for a free copy of "A Machinist's Nightmare Becomes a Designer's Dream."

5 Advantages of Inco Precision Castings

Save up to 60% of production costs.
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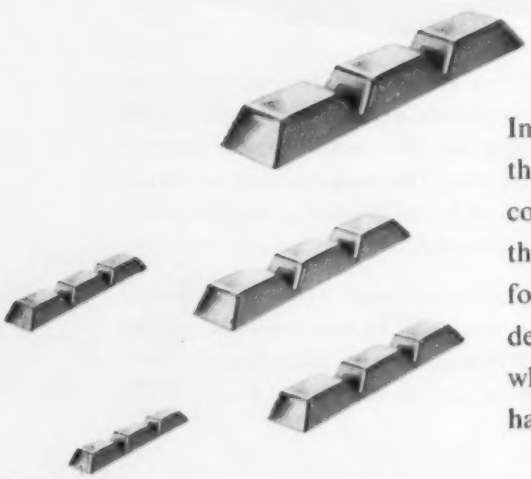

In peace or war, in good times or bad, throughout the past 40 years the Aluminum Smelting Industry, composed of many independent firms, has stood as the *one steady, dependable* source of supply for foundrymen and die casters. In times of extreme demand for aluminum for wrought products, or whether aluminum was scarce or plentiful, Smelters have always been your steady suppliers.

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An interesting article on the Aluminum Smelting Industry and its history appeared in the November issue of "Modern Metals." It's a question and answer article that tells many of the answers to questions bearing on your supply problems. Write for your copy today.

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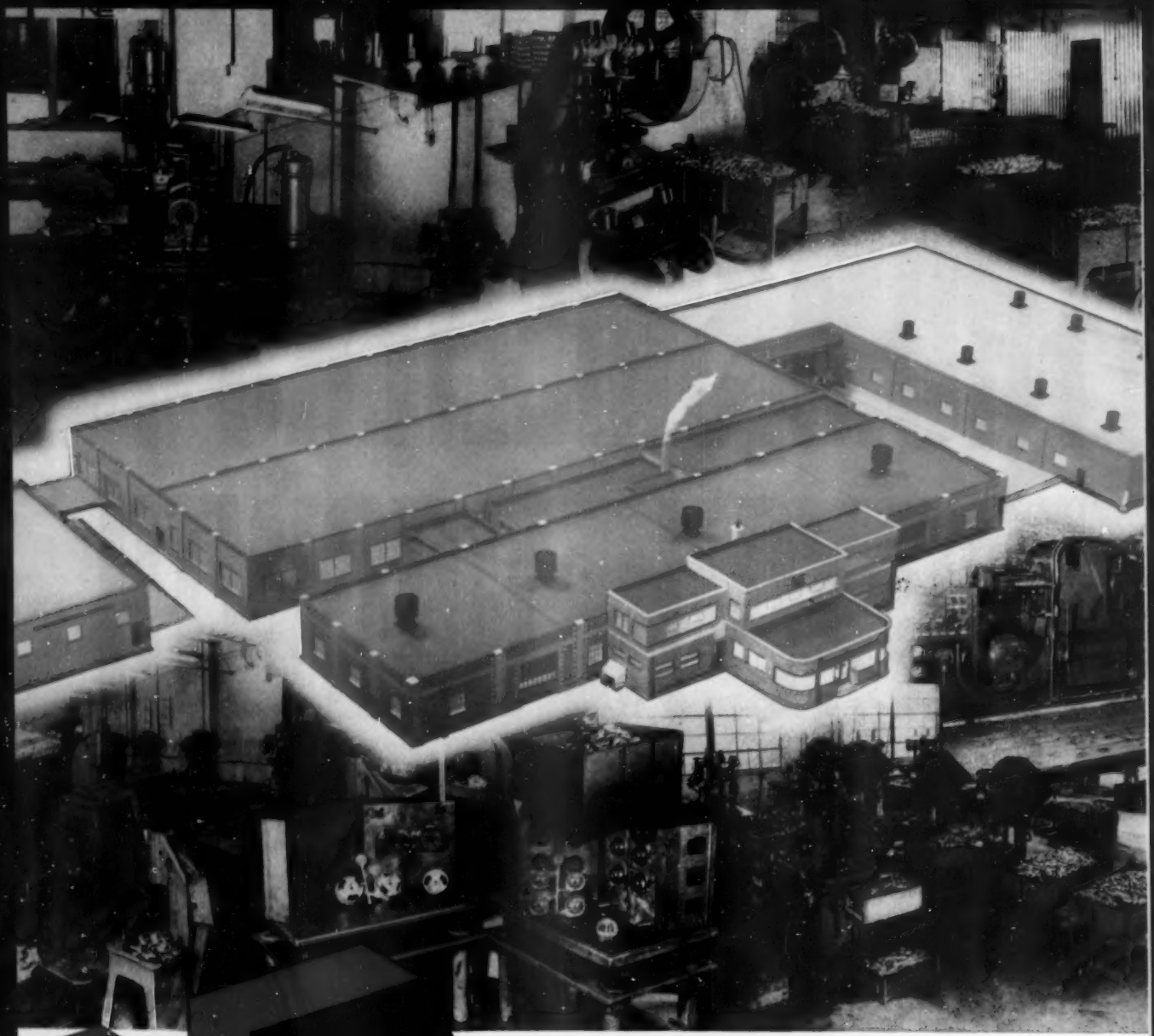

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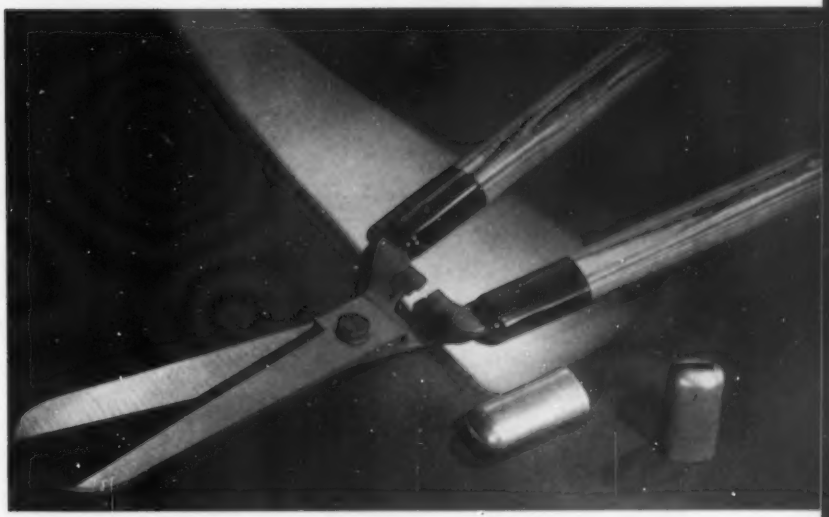
NEW ENGLAND DIE CASTING CO., WEST HAVEN, CONN.

Ferrules— New Use For Zinc Die Castings



ALMOST since the time that manufacturers first used wooden handles on metal implements they have also used metal ferrules.

The ferrule anchors the metal portion and the handle together through the use of a bolt or rivet so that the wood will not split, the anchor member loosen or fall out. The ferrule further prevents splitting of the handle, particularly when severe strains on the wood occur. Finally the ferrule protects the handle at the point where it is most likely to be battered in use.

In the past, most ferrules have been made of sheet metal, either as a sleeve, open at both ends, and rolled into a cylinder or truncated cone, or a drawn cup with a clearance hole in the end to allow the metal member to pass through it.

The material of construction is generally sheet steel, though in some cases brass, aluminum or other sheet stock has been used.

The use of zinc die cast ferrules by the True Temper Corp. is a distinct departure from long established custom.

Why is a die casting used for this application? Basically, because it is less expensive due to a combination of several factors.

Tooling Costs

Consider first the question of initial tooling. To draw a ferrule from sheet metal, particularly if a rather heavy gauge material is required, demands the use of progressive dies since the ratio of height to diameter is too great to permit drawing in a single step. Compare this tooling investment with a single pair of die casting dies which will cast six, eight, or even more ferrules per shot and a single trimming die to remove flash. Tooling costs for die casting will be far lower.

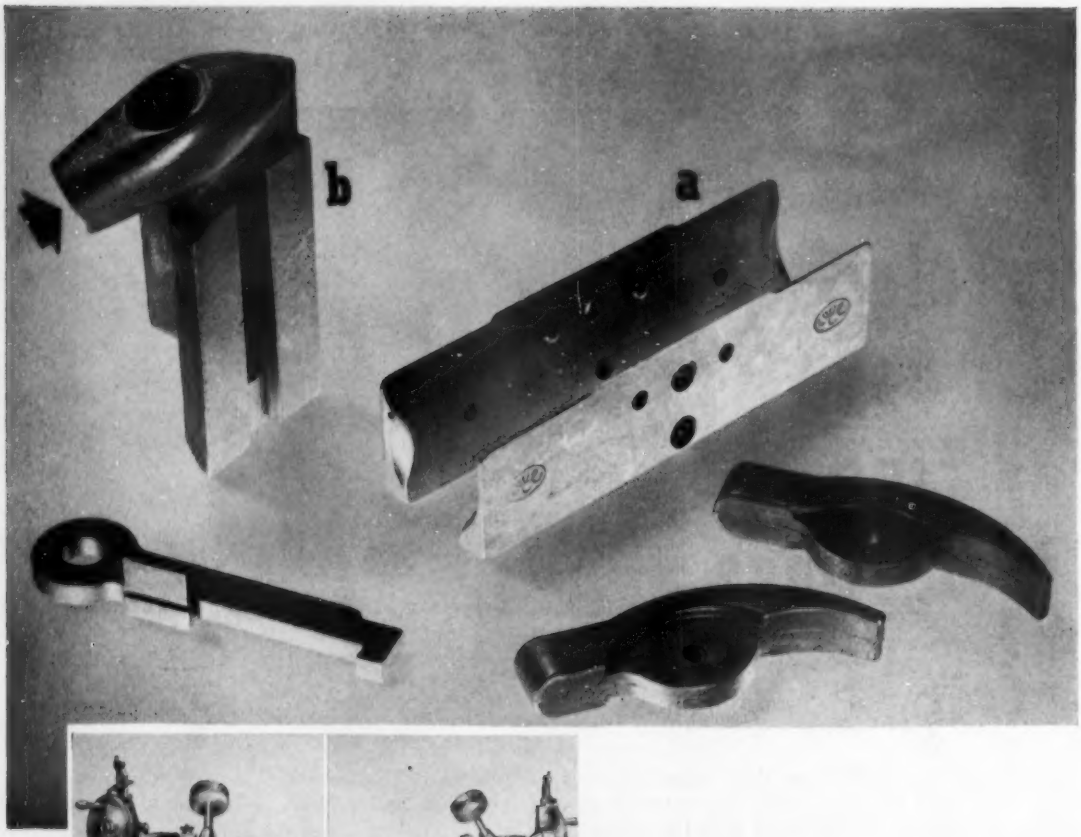
Along with initial tooling costs, one must consider tool maintenance. Where production runs are long, as they are in this case, drawing dies must be removed from service periodically to be redressed. If production is to be maintained, duplicate tools have to be provided or the operation will be shut down during dressing. With die casting, on the other hand, well-made, hardened dies working in zinc are capable of making hundreds of thousands of parts with only minor repairs or service.

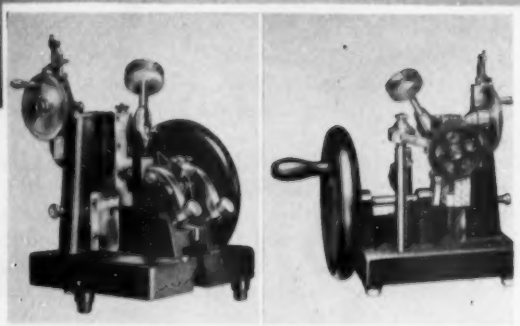
Machining And Finishing

As can be seen in the illustration, one hole for a rivet must be provided; in all cases this is drilled. The use of a zinc die casting lengthens drill life and extends the time between sharpenings. While this may seem a small item, on a component such as these ferrules, costs are counted in mills and any saving becomes important, however small.

Finally, there is the surface finishing. Almost any finish for corrosion protection or decoration that can be applied to steel can be applied to a zinc die casting. Cleaning prior to finishing is likely to be simpler and less expensive in the case of a die cast plug.

For all of the reasons noted above, the use of die cast ferrules is an important advance since it gives a lower cost in manufacture and a better end product.





How To Save

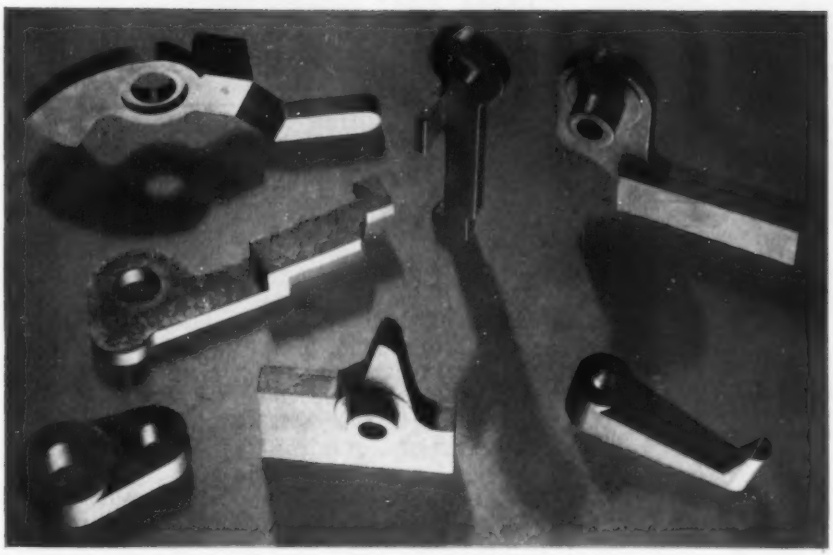
WHEN the amount of play within a dovetail slide must be limited to one micron, the highest calibre of hand finishing is required, but this company has found a way to minimize the amount of highly skilled machine work needed to build precision instruments . . . the use of investment cast components.

IN a machine that is capable of cutting a slice 0.00000098425" thick, the term *precision* gains new significance.

To build such a machine requires more than close finished dimensions . . . it calls for highest standards of surface finish, closest fit among related components, and an overall structural solidity.

International Equipment Company of Boston builds a rotary microtome that fits this description. For the layman, a microtome is the scientific version of a meat slicer, used to obtain ultra-thin slices of material to be examined under a microscope in a pathological laboratory.

International's standard model, the Minot Rotary Microtome, is capable of producing a slice that is two microns in thickness. The operator may adjust the indexing head so that the lead screw advances the specimen 2, 4, 6, 8, 10, 12, 14 or 16 microns for each revolution of the drive wheel.



1. LAB SPECIMENS as thin as 1/40th micron can be produced with this microtome, ***Inset left.***

2. FLAT, THIN EDGE of blade holder (a) and complex shape with angular hole (arrow) on specimen holder (b) are impressive features of castings, ***left.***

3. SHAPES that are investment cast to save machining and assembling are displayed, ***right.***

Skilled Instrument Makers' Time

However, rapid development of the electron microscope has recently permitted the study of sections only a fraction of a micron in thickness. To meet the need for thinner specimen samples, International developed its Ultra-Thin Sectioning Microtome, Figure 1.

By inserting either a 40:1 or an 80:1 worm-gear reduction as a modification of the standard model, International has built microtomes that are capable of producing slices 1/20th or 1/40th of a micron in thickness.

This type of instrument cannot be manufactured on a production line basis. The amount of hand fitting and finishing is too great to permit this. Furthermore, the total number of units produced per year does not indicate elaborate tooling or capital investment.

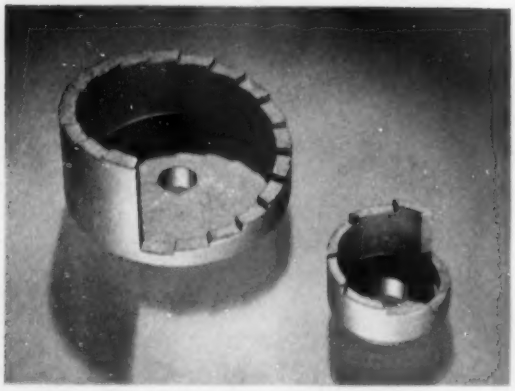
However, in designing these instruments, International has been able to utilize investment castings to save a great deal of time for its skilled instrument makers. Altogether, 16 investment castings are used in one or the other of these microtomes. All of these castings are produced by Hitchiner Mfg. Co., Inc.

The first investment casting was introduced four years ago and this experiment was so successful that many other parts have since been converted.

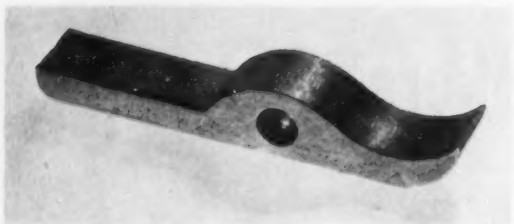
The first investment casting was the blade holder which grips a double edged razor blade. The blade holders, Figure 2a, were previously cut from bar stock. Various types of steel were tried, but difficulty was encountered in getting and retaining a perfectly straight flat edge needed to apply a uniform pinch the full length of the blade.

The ability to produce a thin, flat casting that is close enough to size to be finished by grinding is the advantage which investment casting has in comparison with the previous method used:

Continued next page



4. TWO HOURS machine time were previously required to cut from the solid. Now it is investment cast close enough cut from the solid. Now it is investment cast close enough to dimension to need only cleaning up. Smaller index head appears at right.



5. FORM MILLING and cut-off was once the method used to produce this pawl, but investment casting now completely eliminates machining. It is shown here as furnished by the investment caster.

Close Cast Dimensions Reduce Number And Type Machining Operations

machining from bar stock. The casting is finish ground to a knife edge.

Another example of the saving in skilled hand work gained from investment casting is the specimen holder, Figure 2b, which was formerly made as a sand casting. The critical surface specifications necessitated extensive polishing, machining and grinding on almost every surface.

This piece was probably the most difficult one on the entire machine to produce because its shape does not lend itself to simple machining setups. Since conversion to an investment casting, the amount and character of the machining has been simplified but not eliminated. As an example of the dimensional requirement of this part, there may be no more than one micron of play between the dovetail on the casting and the dovetail slot in which it moves; greater looseness would result in variations in the thickness of slices made by the machine.

Another especially close tolerance in this casting is between the dovetail and the tapped hole indicated by arrow at Figure 2b. This is obtained by machining.

A group of seven typical investment cast microtome parts that were previously machined from bar stock or fabricated from bar and rod are presented in Figure 3. These include a variety of plates, levers, cranks and similar parts. As investment castings, the principal finishing operations are facing, grinding, reaming or other light operations.

From the aspect of quantity and type of machining saved, the index heads, Figure 4, are perhaps the most spectacular. These were formerly machined from solid bar, turned down to make a hollow shell, and the steps milled.

The larger index head has 20 steps, now cast accurately enough to require only a cleaning up of surfaces. Previously, the index heads were chucked in a milling machine, and each step milled individually to a tolerance of .004 - .005. A total of about two hours of machining time was required for all operations, most of which have been completely eliminated now.

The pawl which engages the notched feed wheel, Figure 5, is a relatively simple component which, nevertheless, saves a great deal of work as an investment casting. This piece was form milled from bar and then cut off in proper lengths and holes drilled. Now, they are furnished as finished components by the investment caster.

In this extremely precise scientific equipment, investment castings are being used as a shortcut to obtain highest quality components without the expenditure of excessive skilled labor. Even in small quantities, investment castings have brought substantial savings.

Can you really save money by using shell mold castings? What kind of tolerances are realistic? How much draft allowance should be provided? These points are considered here in the third installment of this article which originally was written as a series of letters from a foundry executive to his customers.

Take A Good Look At Shell Mold Casting

BY WILLIAM S. THOMAS, Vice President
Emmaus Foundry and Machine Co., Inc.

(In the first two parts of this series, Mr. Thomas offered a realistic appraisal of what shell molding can and cannot do, listed specific advantages and discussed some of the materials used in shell mold casting.—Ed.)

SOME common sense is necessary in the tolerance question. Perhaps on the small and medium size shell castings, all but critical surfaces could stand tolerances of ± .010.

It is possible to produce castings which will be true to pattern, within .002 of pattern size, with a minimum tolerance of about .003. This is true only on those surfaces which are contained in one-half of the shell. Relationship between both halves of the shell are dependent upon the accuracy of fit and position of the locators. Tolerances across the parting line are entirely dependent upon the tightness of the joint around the casting cavity and the support which may be necessary while the molten metal is solidifying.

A casting is never more accurate than the pattern from which it is made. Higher production and closer tolerances in sand foundry practice have called for more skill and ingenuity on the part of the pattern maker. In shell molding, both production requirements and casting accuracy are reaching goals never before thought possible.

Shell molding is making rapid technical strides, although the economic picture remains somewhat cloudy. Based on the cost and finish of the molded product, the shell molded casting seems to stand somewhere between products made by conventional casting and investment casting methods, except that in shell molding, castings of greater size and weight can be made than in the 2 pounds limit of conventional investment castings. Reports of 200 pound shell molded castings have been received.

Potential users, while interested, are not fully aware of shell molding costs and are not sure just how far shell molding has progressed or what type of job can be handled. Although we at Emmaus do not know all the answers, we are passing along to our customers and the general public, all of the information that we secure through our daily work in experimenting with different types of castings.

We are still not in a position to give definite figures on either the cost of the pattern equipment or the casting. We can only estimate from what experience we have gained up to date which only covers a few types of castings. There is no question in our mind that when some items, such as resins are produced in larger quantities, the cost will be reduced and this also applies to machines and accessories, so that in the not-too-distant future the cost of shell molded castings will not be very much above that now charged for a high quality conventionally made casting.

The potential user of shell molded castings must consider many factors before deciding to give out orders for this type of

Continued on page 69

Why A Die Cast Housing?

In specific terms, see how the eight factors listed at the right work out when applied to the design of a particular product. The editors of PMM asked engineers of Pennwood Numechron Company why they are using a die cast zinc housing for their attractive "Ship Wheel Clock". Below are their answers.

1. TOOL COSTS

If the case were to be made from sheet metal it would have to be made in two pieces. Each piece would require a blanking and forming die. In addition, separate dies might be needed to indent the front panel and punch out the opening for the numeral panel. All of these operations might require duplicate tooling when large numbers of cases are to be made.

Another set of tools would be required to punch the holes to accommodate the wheel handles and the handles would be screw machine parts requiring special tooling.

As a die casting, one set of casting dies and one set of trimming dies are sufficient to produce several million cases.

2. ASSEMBLY OF THE CASE

A drawn case would consist of two major parts with the wheel handles as separate units. The two parts of the case would have to be assembled and brazed together and the handles either riveted or brazed in place.

Inside of the case, wherever the need for a fastening device exists some sort of boss, pin, lug or other part would have to be separately made and assembled onto the case.

With a die casting, the entire case is a single unit. All of the handles are cast integrally and necessary bosses, pins, lugs, etc. are cast on, carefully located and most of the holes for screw, cored.

Thus, in this case, die casting has ilimi-nated all preliminary assembly operations.

3. ASSEMBLY OF COMPONENTS

Because all mounting devices are cast integrally with the case, assembly is vastly simplified. In this particular case, machine screws entering into four cored and tapped holes fasten the entire clock mechanism into the case. Machine work is, therefore, virtually eliminated. In some cases, self-tapping screws might be used in place of machine screws thus saving a tapping operation.

4. HIGH SPEED FASTENERS

It was noted above that machine screws are used for fastening the mechanism into the case. In some instances it is more desirable to incorporate smooth studs and use self-fastening spring clips. Another commonly used fastening device with die castings is to cast a smooth stud which is later peened to provide an integrally cast rivet. The fact that die cast metals are soft makes this last method particularly attractive, in this same category comes staking which is possible because of the softness of the metal.

1. **TOOLING** costs are generally lower.

2. **ASSEMBLY** operations on the housing can be eliminated.

3. **ASSEMBLY** of internal components is simplified.

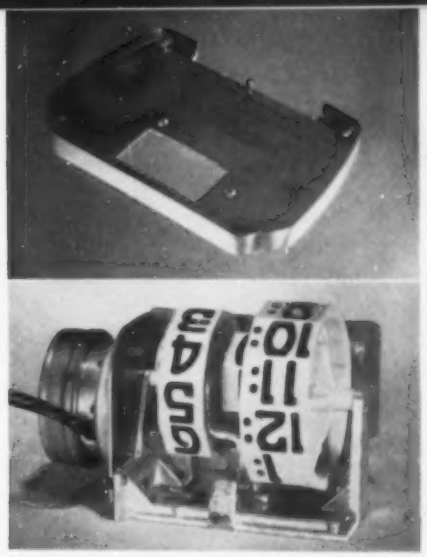
4. **HIGH SPEED** fasteners can be used.

5. **ALIGNMENT** and rigidity are improved.

6. **SEPARATE** name plates can be omitted.

7. **DECORATIVE** trim may be integral instead of assembled.

8. **SURFACE** finishing may be simplified.



To Make a Complete Assembly . . .
. . . Pennwood Numechron depends upon die casting to provide a mounting frame and base plate, shown above. These are more accurate, stronger and less expensive than would be possible by any other fabricating method.

5. ALIGNMENT AND RIGIDITY

Where hand assembly operations are used there is always chance for error and the more operations that must be performed the greater the possibility of mistakes. With all of the mountings cast in this cause of rejects is eliminated. Alignment is automatic.

For a case made from sheet stock light gauge metal would be used to avoid the necessity of excessively large die sets and huge presses. This light gauge metal, in turn, brings up the probability of a case that is not sufficiently rigid. If stiffening members are incorporated in the design they must be separately fabricated and installed. With a die casting, however, these stiffening members, if needed, are incorporated in the die design.

6. NAME PLATES

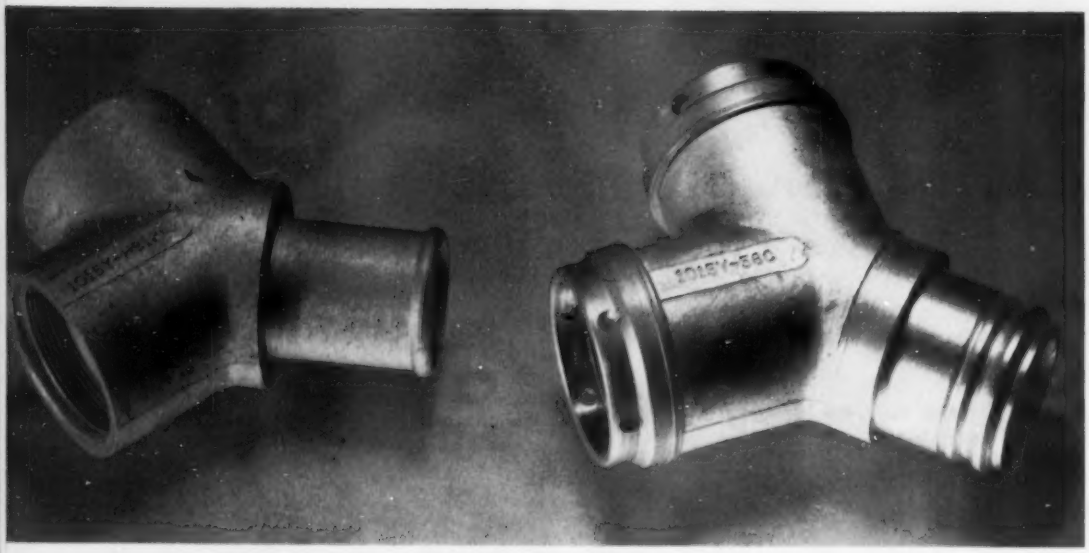
Where a name plate or other identifying or instructional lettering is needed, it must be on a separate plate when a stamped case is used. With a die casting, the die is suitably engraved and all lettering cast on. Legibility and permanence are both improved and the cost of name plates and the cost of applying them is saved.

7. DECORATIVE TRIM

In many cases, as in the one illustrated, some sort of decoration is desired. In this case, the wheel handles and the depressed panel. As a die casting, these are easily incorporated in the casting. Other methods of fabrication would require separate machine and assembly operations to achieve the same result.

8. SURFACE FINISHING

Whether or not surface finishing is lessened or the cost of it reduced will depend upon the quality of the die casting. Where a part is to be finished in baked enamel or lacquer only some sort of a phosphate or chromate primer coat is needed followed by painting. If plating is to be used then a die casting must be produced with a so-called hardware finish if much sanding, polishing and buffing is to be avoided. By proper selection of the final finish and insistance on a good cast surface it should be possible to lower finishing costs below those for a stamped case.



BOTH of these pieces are made by machining castings that are produced from one cavity.

Proper Alloy Choice Reduces Porosity

THE two "Y" connectors shown in the illustration are the same part, and since they differ only in the size and exterior detail of the stem, a single aluminum permanent mold casting can be used and the two "Y's" made from it.

Because some of the walls are relatively thin, the foundry making the piece, McCord Industries of Baltimore, Md., used an alloy that was extremely fluid at casting temperatures. This alloy gave an excellent appearing part, but unfortunately showed a high degree of porosity when tested after machining.

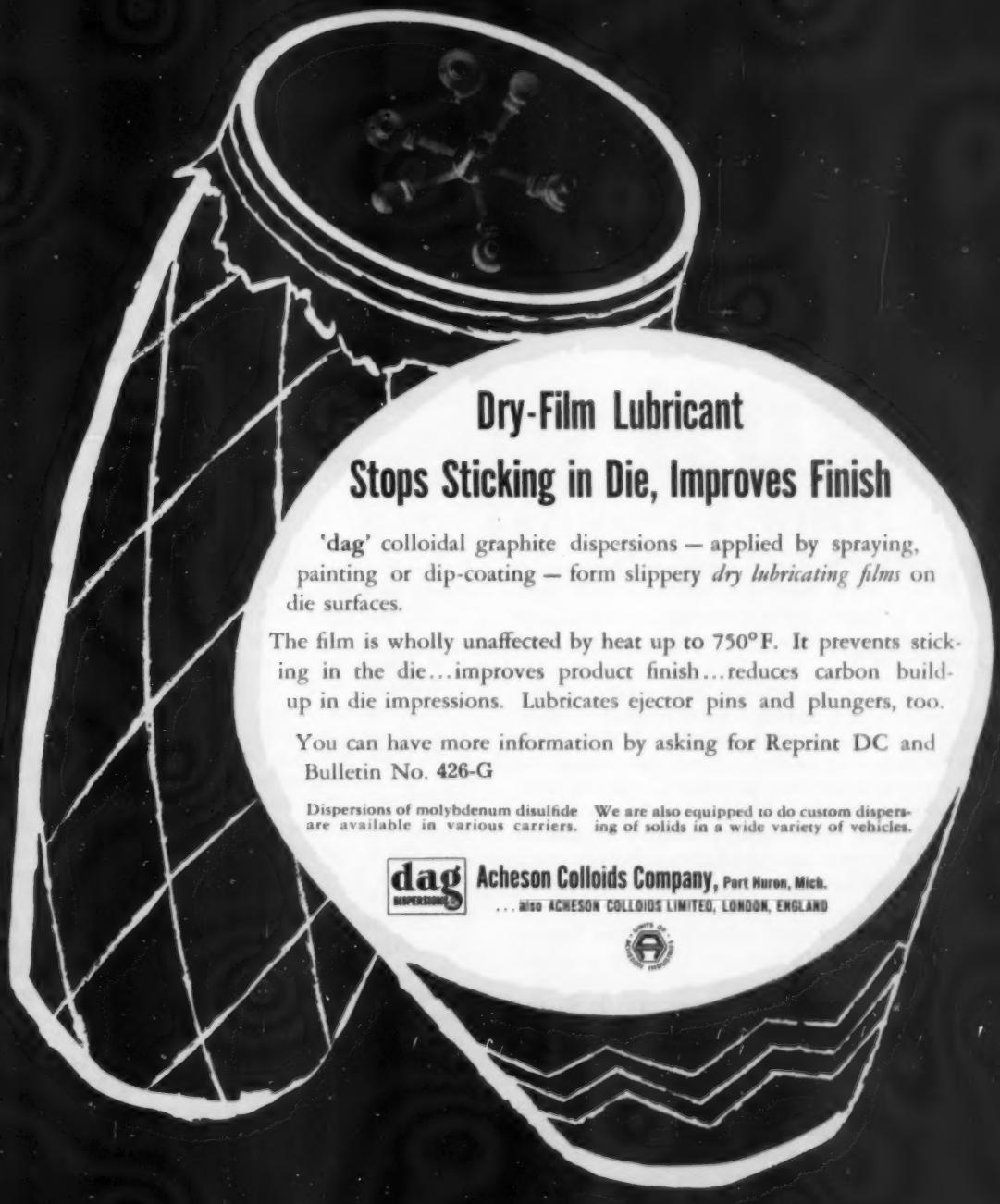
To overcome this, a 7 percent silicon alloy is employed and porosity is now negligible. In this application, even porosity does not mean that a casting must be rejected, since any one of the many impregnants now available will completely seal minor porosity.

After the "Y" is received from the foundry, the two branches must have an inside thread machined in them. This simple job, together with machining the stem to the desired size and contour, completes all of the machine work. In this connection, it should be noted that as the volume of parts needed increases, the machining on the stem will be eliminated by construction of another mold and thus further reduce secondary operations.

For corrosion protection, these parts are anodized. Anodizing has the further advantage that color coding is possible and in some cases where the part is employed, this is desirable.

At the present time, it is necessary to stamp the part number on the casting after it has been machined. With the contemplated production change which will eliminate the manufacture of two parts from one casting, this numbering can be incorporated in the mold, thus eliminating another hand operation by casting the numbers directly onto the part.

telling the story of 'dag' dispersions



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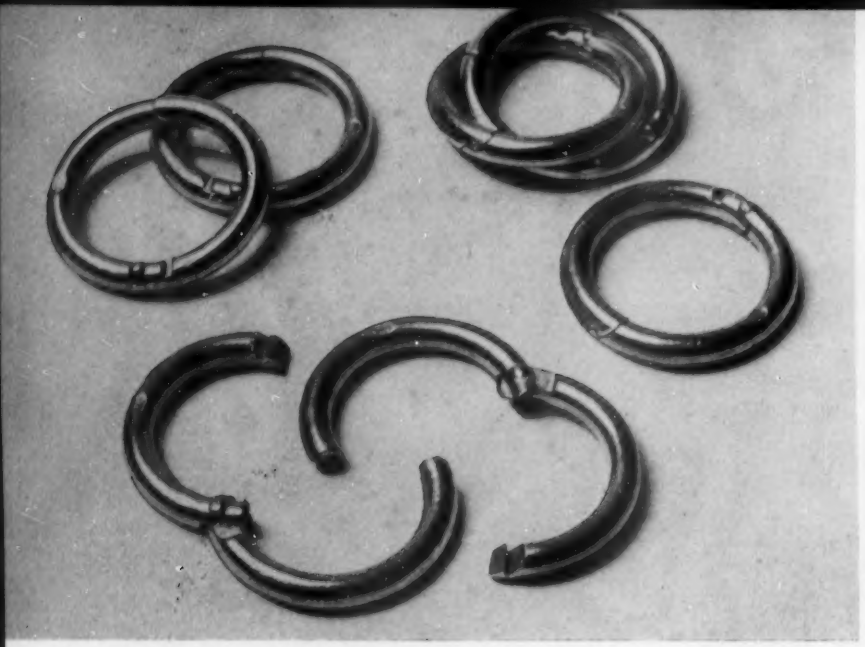

DIE CASTINGS

They Come From The Die Already Hinged

DIE CASTINGS that are hinged together as they come from the die were made possible by a casting method announced a couple of years ago by Gries Reproducer Corp., New Rochelle, N. Y.

At the time the process, called Intercasting, was announced, samples were offered to illustrate what could be accomplished. These included tiny die cast zinc scissors that come from the die as a completely assembled, working unit; continuous, interlinked chain; and specially-designed pintle chain with Y-shaped elements. These latter two can be produced in thousands of feet of continuous chain, or in predetermined lengths.

A recent check with officials at Gries Reproducer was made to find out whether practical applications have been found for the unique Intercasting technique. Of the several jobs currently in full-scale production, perhaps the most spectacular are those familiar items, loose leaf binder rings.

A group of plated die cast zinc binder rings is displayed above. Except for plating, nothing needs to be done to these castings after they come from the die: they are complete with hinged assembly and interlocking nibs. Note that the hinge pin is integrally cast and is not an insert.

Compare this one-step technique from molten metal to completely assembled end product with the previous method of manufacturing.

1. Two pieces of wire were cut off.
2. Hinge end of one half was straddle milled.
3. Hinge end of mating half was slotted.
4. Small hinge hole was drilled.
5. Interlocking nibs were milled on open end of each piece.
6. Hinge pin was cut off from wire.
7. Binder halves were formed into semicircle.
8. Two halves were assembled with hinge pin.

Aside from the apparent economy of replacing eight individual operations with a single step, the die cast binder rings have additional advantages.

The hinge is cast with a class of fit that is essentially perfect; there is no play in the hinge. This gives a tighter closure. There is sufficient elasticity in the zinc alloy to permit the opening and closing of the rings without undue exertion.

Because the rings are made of zinc instead of steel, there is no problem of rusting. The surface of the castings is smooth as cast, and the rings can therefore be bulk finished by barrel technique without excessive costs.

Limitation on the Intercasting process, according to the manufacturer, includes: maximum length 1½ inch; maximum weight up to half ounce; minimum weight unlimited; metal, zinc alloy.

ANOTHER DIE CAST PRODUCT MADE BETTER ON KUX DIE CASTING EQUIPMENT

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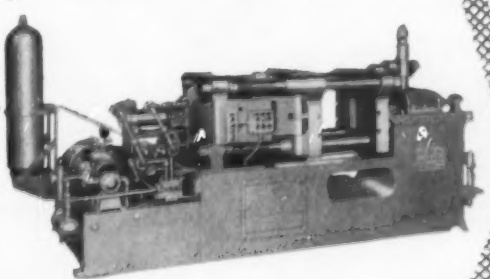

MODEL BH-30 ILLUSTRATED

Hydraulically operated die casting machine for production of zinc castings weighing up to 10 pounds.

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TECHNICAL REPORT

A Powder Metallurgy Technique For

High Density-High Strength Parts

By Edmund N. Mazza, Metallurgist
Atomic Energy Div., Sylvania Electric Products, Inc.

THE use of metal powders in the fabrication of many structural parts such as gears, cams, pole pieces, caster wheels, etc., has gained world-wide acceptance. The utilization of this technique in new applications has made it necessary to combine metal powders either by prealloying or alloying during sintering, to form materials which possess properties such as high heat resistance, corrosion resistance, high density, and high strength. It is the aim of this study to set forth a procedure to obtain alloys of high density and high strength by alloying during sintering

Since iron powder is used extensively in the production of metal powder parts, the alloys investigated were made from iron with additions of copper and graphite. Copper and graphite are popular additives to iron powder in the production of iron-base porous bearings and molded machine parts produced by powder metallurgical methods, due to the fact that these elements increase tensile strength and hardness and are easy to incorporate in iron powder mixtures. Varying percentages of both were studied, and their effects on the physical properties were evaluated.

Procedure

Swedish sponge iron powder, grade MH/100, tested in accordance with the standards[1] of the Metal Powder Association, was used in making the various mixtures.

The apparent density of the lot of iron powder tested was 2.42 g/cc. It had a flow of 31.6 seconds. A typical sieve analysis is as follows:

Mesh	*Percent*
+80	trace
+100	0.9
+150	17.9
+200	27.1
+250	4.3
+325	19.7
through 325	30.1
Total	100.0

Groups of six samples for each test from eight different mixtures were investigated. The compositions are shown in Table I.

Each mixture was tumbled for one hour after being sent through a 100 mesh screen to disperse any balled lubricant or segregated alloying element.

Samples for density determination, dimensional measurements, and hardness tests were compacted at 30 tsi in a one-inch cylindrical die to approximately one-half inch in thickness. Fifty grams of powder were used for each pressing. Bars for tensile strength and elongation determinations weighing 25 grams were also compacted at 30 tsi. These compacts were pressed in a special die to produce a standard powder metallurgy tensile bar of rectangular cross-section with a thickness of 0.300, a width of 0.250, and an overall length of 4 inches.

The variables in this investigation were the presintering temperature and the coining pressure as well as composition. The fixed parameters were compacting pressure, weight, and final sintering temperature.

Groups of samples from each mixture to be coined at the selected pressures were presintered for ten minutes at temperatures of 700, 800, 900, 1000 and 1100 C (1292, 1472, 1652, 1832 and 2012 F respectively.) This procedure was used since alloys containing graphite tend to increase in hardness after sintering, making coining difficult. The presintered compacts were coined at 30, 50 and 70 tsi.

After coining, the cylinders and bars were sintered at 1120 C (2048 F) for one hour. The temperature selected was above the melting point of copper so that sintering of the copper-bearing alloys would take place in the presence of a liquid phase.

Presintering and final sintering of all specimens was conducted in an atmosphere of dissociated ammonia. Those samples containing graphite were sintered in a covered carbon boat to eliminate, as much as possible, excessive loss of graphite from the compacts.

Discussion of Results

The effect of composition and the processing variables on the density, tensile strength, hardness and elongation is shown in Tables 2, 3 and 4 respectively.

Experiments performed at Ekstrand and Tholand, Inc.

The effects of increased presintering temperatures and coining pressures on the densities of the compacts made from the various compositions are shown in Table 2. In general, the density has a tendency to increase up to the range of 900 to 1000 C presintering temperature; above this a decrease takes place.

This phenomenon [2] may be explained by the fact that, in this presintering range, self-diffusion of gamma iron takes place at a slower rate than the self-diffusion in the alpha range, even though the temperature is higher. This results in less sintering at the higher presintering temperatures, causing less shrinkage and lower density.

It may be noted that the samples of sintered iron powder compacts show higher densities than those containing copper. In previous experiments by Kuzmick and Mazza [3], it was observed that copper additions resulted in a decrease in density apparently due to molten copper penetrating between the iron particles and thus causing a growth in the compact.

From an evaluation of dimensional changes (Table 5) one may observe that less growth on the diameter takes place in the high presintering temperatures up to 1000 C and in increase in density is observed. Above this temperature, the increased self-diffusion of gamma iron takes place as described above. In all probability this high temperature results in a more porous surface by a reduction of the oxide present in the iron particles, so that a large quantity of copper is absorbed in the pores.

These same results are obtained by an addition of 1 percent graphite to the iron-copper mixtures; this aids in the reduction of the oxide present, in addition to alloying with the iron to form steel. A study of Table 5 shows the decrease in growth on the diameter of the compacts to which graphite has been added, (Columns V and VI as compared with Columns III and IV). The most important effect of graphite addition, however, is the marked increase in tensile strength as shown in Table 3.

The effect of presintering temperatures on the tensile strength of the various mixtures is best seen as graphically illustrated in Figure 1. One may note that the tensile strength of the sintered iron and the alloys increases with presintering temperature to an optimum point, and then at the highest presintering temperature declines. This phenomenon coincides with the effect noted in a study of densities in Table 2.

The effect of increasing copper additions on the density and tensile strength of compacts may be noted by a comparison of Table 2 and 3. It may be seen that the density decreases with an increase in the percent of copper, with the reverse result in the tensile strength. This fact, in all probability, may be due to the filling of the voids with copper.

When iron powder is the only constituent in the sample, the data indicate improvement in density and tensile strength to be so slight during increase in presintering temperature from 700 - 1000 C, that there is little advantage in using the higher temperatures. It is true that slightly better properties do result as the presintering temperature is increased, and this is due to better particle-to-particle

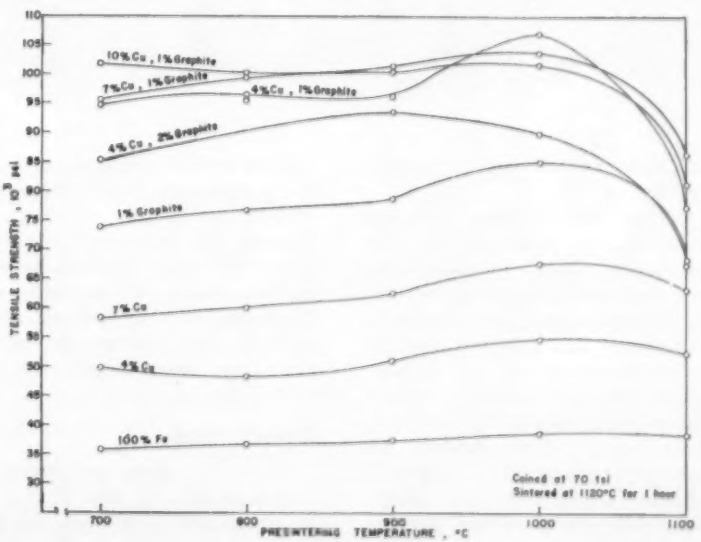
Continued next page

TABLE I. A summary of metal powder components in the various ferrous mixtures.

Mixture Number	Weight Percent of Alloying Elements Fe*	Cu**	C***
I	100	–	–
II	99	–	1
III	96	4	–
IV	93	7	–
V	95	4	1
VI	92	7	1
VII	89	10	1
VIII	94	4	2

*MH/100 Swedish Sponge Iron Powder, produced by Hoeganaes Sponge Iron Co.
**MD 151 Copper Powder, produced by Metals Disintegrating Co.
***No. 8485 J. Dixon Graphite.
1 percent zinc stearate was added as a lubricant to each mixture.

FIGURE I. The effect of pre-sintering temperature on tensile strength of iron and iron base alloys.



SUMMARY OF PROPERTIES

Iron base mixtures whose properties are listed in four tables here were compacted at 30 tsi, presintered and coined as indicated, and sintered at 1120 C in a associated ammonia atmosphere.

Table 2. Densities

Presintering Temp. °C	Coining Pressure, tsi	Sintered Density g/cc I 100% Fe	II 1% C	III 4% Cu	IV 7% Cu	V 4% Cu, 1% C	VI 7% Cu, 1% C	VII 10% Cu, 1% C	VIII 4% Cu, 2% C
700	30	6.77	6.60	6.47	6.40	6.61	6.63	6.73	6.33
	50	6.96	6.78	6.81	6.70	6.84	6.81	6.98	6.64
	70	7.20	7.05	7.02	6.88	6.85	6.84	6.96	6.84
800	30	6.85	6.70	6.60	6.47	6.68	6.71	6.76	6.37
	50	7.05	6.89	6.92	6.77	6.91	6.85	6.91	6.66
	70	7.38	7.10	7.11	6.95	7.03	6.81	7.00	6.88
900	30	6.85	6.70	6.62	6.56	6.71	6.74	6.79	6.40
	50	7.01	6.96	6.93	6.84	6.99	6.86	6.95	6.67
	70	7.41	7.13	7.12	7.04	6.98	6.81	7.01	6.91
1000	30	6.84	6.69	6.68	6.55	6.70	6.71	6.78	6.30
	50	7.06	6.86	6.94	6.86	6.96	6.86	6.98	6.59
	70	7.39	7.18	7.26	7.10	6.90	6.79	7.02	6.90
1100	30	6.76	6.60	6.58	7.45	6.42	6.24	6.36	5.99
	50	7.03	6.89	6.96	6.76	6.48	6.27	6.50	6.13
	70	7.29	7.15	7.17	7.03	6.78	6.70	6.90	6.62

Table 3. Tensile Strengths

Presintering Temp. °C	Coining Pressure, tsi	Tensile Strength (psi) I 100% Fe	II 1% C	III 4% Cu	IV 7% Cu	V 4% Cu, 1% C	VI 7% Cu, 1% C	VII 10% Cu, 1% C	VIII 4% Cu, 2% C
700	30	25,100	56,950	40,650	42,750	75,300	77,550	76,000	59,000
	50	31,750	67,650	46,400	52,750	93,950	92,100	91,700	62,250
	70	35,750	74,000	49,900	58,400	94,950	95,045	101,650	85,300
800	30	27,800	59,650	39,050	46,700	82,150	81,900	80,400	55,000
	50	34,100	71,750	46,450	57,400	93,850	96,150	89,300	78,000
	70	36,700	76,550	48,350	60,000	96,450	99,050	99,150	95,500
900	30	27,700	63,750	38,950	52,400	81,900	91,000	81,000	61,600
	50	35,300	75,750	48,250	55,050	95,400	101,000	93,850	88,250
	70	37,600	78,250	51,000	62,900	96,150	101,250	100,700	93,750
1000	30	28,350	63,050	35,400	49,150	83,500	85,350	80,500	55,100
	50	34,900	78,350	47,500	57,600	94,500	97,000	93,750	75,000
	70	38,700	85,050	54,550	67,600	107,000	103,500	101,500	90,000
1100	30	25,650	47,150	34,300	44,550	54,750	56,400	59,250	49,750
	50	34,550	61,000	42,700	57,100	62,800	68,200	65,050	51,650
	70	38,500	67,350	52,350	63,450	79,950	86,500	81,300	67,750

diffusion resulting in better density.

It may also be noted that the ductility, as indicated by the elongation shown in Table IV, increases with higher presintering temperatures. Iron compacts as pressed and sintered usually show shringage or no dimensional change; however, when presintered, coined, and sintered, the compacts show growth. In general, the highest density and tensile strength are obtained when iron compacts are presintered at 1000 C.

In the case of iron-graphite compacts, optimum tensile strengths and densities are obtained at presintering temperatures between 900 and 1100 C. Like any carbon steel subsequent heat treatment of the sintered compacts to form martensite results in an increase in tensile strength with a loss in ductility.

Conclusion

From the data set forth in Tables II, III, IV, and V, it may be concluded that *high density and high tensile strength may be obtained using various compositions, coining pressure and presintering temperatures. It may also be noted that high density does not necessarily result in high tensile strength, and that the alloying element has a decided effect on density, tensile strength, hardness, and elongation.*

This is from a study of the densities obtained from iron powder samples which result in the highest densities and elongations with resulting low tensile strengths and hardness. By the

Table 4. Sintered Hardness & Elongation

Presintering Temp. °C	Coining Pressure, tsi	I 100% Fe Hard. R_F	I Elong. %	II 1% C Hard. R_B	II Elong. %	III 4% Cu Hard. R^B	III Elong. %	IV 7% Cu Hard. R_{BJ}	IV Elong. %	V 4% Cu, 1% C Hard. Rc	VI 7% Cu, 1% C Hard. Rc	VII 10% Cu, 1% C Hard. Rc	VIII 4% Cu, 2% C Hard. R_B
700	30	57	8	76	1	35	2	52	2	6	9	11	72
	50	66	11	85	2	55	2	58	2	15	15	20	88
	70	72	15	84	3	63	3	66	2	16	17	25	90
800	30	63	10	79	2	39	2	52	2	8	12	13	78
	50	70	13	85	2	55	2	64	2	17	18	23	89
	70	76	16	87–	3	63	3	68	2	19	17	22	93
900	30	63	10	80	2	38	2	60	2	9	15	12	72
	50	70	13	86	2	53	2	62	2	13	18	24	89
	70	76	16	89	3	63	3	71	2	17	—	20	94
1000	30	63	10	77	2	44	2	60	2	7	13	8	70
	50	68	13	87	2	59	2	66	2	15	19	25	80
	70	73	20	85	3	65	3	72	2	18	—	20	89
1100	30	62	10	80	2	39	2	64	2	R_B 80	4	8	61
	50	71	13	75	2	60	2	72	2	R_B 79	13	21	77
	70	75	20	85	3	68	3	79	2	R_B 87	7	11	65

Table 5. Diameter Changes

Presintering Temp. °C	Coining Pressure, tsi	Diameter Change After Sintering I 100% Fe	II 1% C	III 4% Cu	IV 7% Cu	V 4% Cu, 1% C	VI 7% Cu, 1% C	VII 10% Cu, 1% C	VIII 4% Cu, 2% C
700	30	0.000	+0.0025	+0.011	+0.024	+0.007	+0.007	+0.0045	+0.003
	50	+0.001	+0.003	+0.013	+0.022	+0.008	+0.010	+0.009	+0.004
	70	+0.001	+0.004	+0.015	+0.024	+0.009	+0.011	+0.013	+0.006
800	30	+0.000	+0.0025	+0.013	+0.024	+0.007	+0.007	+0.005	+0.004
	50	+0.001	+0.004	+0.014	+0.022	+0.008	+0.010	+0.010	+0.005
	70	+0.002	+0.005	+0.016	+0.024	+0.009	+0.012	+0.012	+0.007
900	30	+0.000	+0.003	+0.011	+0.019	+0.007	+0.006	+0.0055	+0.005
	50	+0.001	+0.004	+0.013	+0.019	+0.007	+0.010	+0.009	+0.006
	70	+0.003	+0.005	+0.016	+0.019	+0.010	+0.019	+0.012	+0.008
1000	30	+0.001	+0.003	+0.009	+0.018	+0.006	+0.006	+0.0055	+0.004
	50	+0.002	+0.0035	+0.013	+0.016	+0.007	+0.009	+0.008	+0.005
	70	+0.003	+0.005	+0.015	+0.020	+0.011	+0.019	+0.013	+0.0075
1100	30	+0.001	—0.001	+0.006	+0.009	+0.004	+0.002	0.000	+0.0025
	50	+0.002	0.000	+0.006	+0.010	+0.003	+0.002	0.000	+0.002
	70	+0.003	+0.005	+0.008	+0.012	+0.003	+0.002	—0.001	+0.0025

same token, iron-copper-graphite compacts result in high tensile strength and hardness with lower density and elongation as compared with iron samples.

The ultimate use for which the part is destined is the factor which will determine the optimum density, hardness, elongation and tensile strength required and what technique will be employed. For an example of the ultimate use determining the properties required, one may consider the case of pole pieces which require high densities for high permeability, good ductility, and fair tensile strengths. For this application, usually 100 percent iron powder is used. From an analysis of the tables, these characteristics may be obtained by presintering at 1000 C and coining at 70 tsi and final sintering at 1120 C.

For structural parts such as cams, gears, and caster wheels which require good hardness, high density, and high tensile strengths, mixtures consisting of either iron-graphite or iron-copper, or iron-copper-graphite may be employed.

Suitable alterations in the properties within the approximate parameters shown for a given composition are obtainable by proper variation of the presintering temperature and coining pressure.

(1) Test Methods—M. P. A. Standard —5-46; M. P. A. Standard—3-45; M. P. A. Standard—4-45.

(2) "Self-Diffusion of Iron" F. S. Buffington, I. D. Bakalar, and Morris Cohen, in "Physics of Powder Metallurgy" by Walter E. Kingston, McGraw-Hill, New York, 1951

(3) J. F. Kuzmick and E. N. Mazza,

Highlights From the Tool Show

Accuracy of Investment Castings . . .

Complicated designs for investment castings introduce so many variables in the foundry that purchasers of precision castings should rely heavily upon the foundry engineers "who can predict the accuracy to be expected of a proposed casting" in making the original designs.

R. L. Wood, president
Arwood Precision Casting Co.

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William L. McCracken director of research, Detrex Corp.

Gearless Drill Heads . . .

Whereas close spindle spacing is sometimes difficult in conventional gear type drill heads, with gearless heads close spacing is a predetermined fact. Machines that drill up to 300 holes per second are now a reality.

Frank Zagar, vice president, Zagar Tool, Inc.

Precision forming and finishing of metals were emphasized at this year's annual sessions of the American Society of Tool Engineers. Here are brief highlights from outstanding papers.

Artificial Abrasives . . .

"Use of abrasives goes back to Stone Age Man sharpening the implements of warfare. But only since the turn of the century have artificial abrasives been commercially available. They are silicon carbide and aluminum oxide, man-made in electric furnaces and directly resulting from a scientific search for a way to make artificial diamonds."

E. E. Oathout, products engineer, Behr-Manning Corp.

Chromate Coatings . . .

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C. W. Ostrander, service manager, Allied Research Products, Inc.

continued on page 66

Circle No. 45 on Reader Service Card

DIE CASTINGS

Low Cost "Gadgets" For The Kitchen

CALL them "gadgets" if you will, all of these articles, and many more like them, are produced for only one reason . . . to make work in the kitchen less of a chore. If such tools are to benefit the greatest number of people they must be both long lasting and inexpensive. To meet these two requirements the manufacturers have chosen die casting as the best and most economical method of manufacture. Generally the castings are made in aluminum since they are likely to come in contact with food; finishing costs are somewhat lower (they need not be chromium plated); they are lighter in weight; and the average housewife has been so thoroughly educated in the use of aluminum in the kitchen that she automatically looks for it for her tools and utensils. The few items illustrated are typical of the die cast products being made both in this country and in Europe. Smooth, bright, white surface color is readily obtained on these die cast items. Most common procedure used for low cost burnishing is a barrel finishing operation. Comparable lustre could only be obtained on sand cast pieces by prolonged polishing, buffing and coloring, inasmuch as the starting point of a sand casting is a rough, pitted surface. By contrast, the starting point of a die cast surface is a smooth, clean surface, sometimes good enough as cast to be termed "hardware" finish.

36½" die casting in one piece with Cast Teeth!

produced by

PARAMOUNT

- Material: #3 Zinc Alloy
- Length: 36½"
- Weight: 2.2 lbs.
- Gear Rack: 279 teeth, 24 pitch
- Calibrations: By 1/16ths

A little out of the ordinary? Yes. But this casting demonstrates what can be done when engineering know-how, die-making skill and die casting techniques are teamed. The result: substantial savings for the customer in material and machining costs!

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ALUMINUM & ZINC DIE CASTINGS

PARAMOUNT

DIE CASTING CO.

St. Joseph, Michigan

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Two Heavy-Duty Electrical Contacts

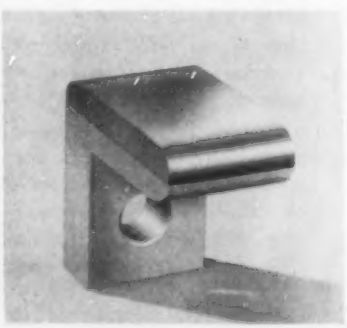
ELECTRICAL contacts made from copper-graphite by powder metallurgy processes are now offered by Gibson Electric Co., for use when high conductivity, non-sticking properties and economy are great factors.

These new powder metal contacts are regarded as an improvement over copper graphite contacts made by impregnating graphite with copper due to higher electrical conductivity and greater mechanical strength of these materials*, which are capable of handling heavy currents without contact sticking.

One recent application of UC-7 involves electrical controls manufactured by Westinghouse Corp. for use in diesel electric locomotives. Normally used as the generator, the dynamo during the starting operation becomes the actual starting motor employing battery current. Gibson contacts close the circuit to the batteries, thus energizing the dynamo and using it as a motor to start the engine. Afterward, the contacts are opened and the dynamo then operates in its normal function supplying current for the traction motors.

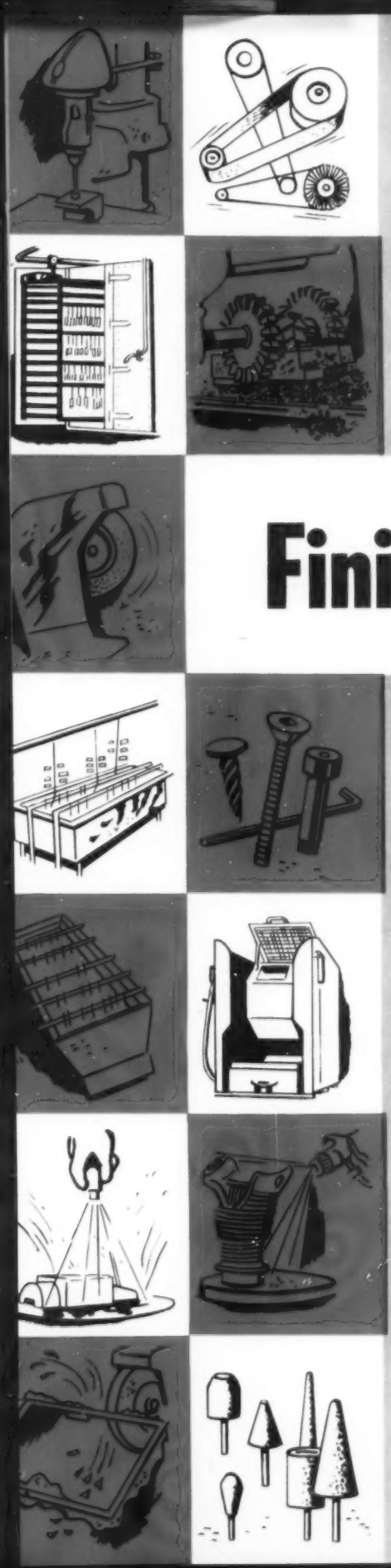
Gibsiloy UC-5 is being used by Canadian Westinghouse Co., Ltd., as a sliding contact on rheostats because of its self-lubricating proper-

continued on page 77



CONTACT used in Westinghouse engine starting contactor for diesel electric locomotive.

*Called Gibsiloy UC-5 and UC-7



PMM

Finishing Section

Finishing includes all secondary operations performed on precision metal molded parts — up to and including final surface treatment. This section presents new information about the specialized methods, equipment and materials needed for finish-machining, assembly, surface preparation and final finishing of all precision metal molded parts.

devoted to the specialized problems of finishing . . .

DIE CASTINGS • INVESTMENT CASTINGS • PERMANENT MOLD CASTINGS • PLASTER MOLD CASTINGS • POWDER METAL PARTS • SHELL MOLD CASTINGS

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Easy change expands chromium plating capacity of existing equipment

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Plastisol rack coating builds up substantial body and resiliency and offers longest service. Also easier and more economical to apply, it provides a positive means for lowering rack insulation and maintenance costs.

In its many years of use, plastisol Unichrome Coating 218X has established a remarkable record for economy. It defies all plating and cleaning solutions, even vapor degreasing cycles.

Bright zinc finish features both quality and economy

With the pressure on to cut costs in every possible way, it pays to take another look at economical chromate finishing.

When processed in Unichrome Clear Dip, zinc plated castings get a finish with brilliance similar to chromium. They're also made corrosion resistant. Topped with one of the time-tested, uniquely durable Unichrome Clear Organic Coatings, such products meet high standards of quality and can deliver a long, attractive service life.

HELPFUL HINTS

by "Mr. Cost Cutter"

For true economy in an organic finish, base your specifications on both quality and applied cost—rather than on misleading cost-per-gallon. Consider 3 flat black finishes for wrought iron, for example:

	applied cost/sq. ft.
Coating "A"	1.2 to 1.3¢
Coating "B"	0.8 to 0.9¢
Coating "C"	0.8 to 0.9¢

A Unichrome epoxy resin type finish, Coating "C" sells for twice as much per gallon as the other two, yet it not only gives best "mileage" but also a better looking, more durable and corrosion resistant finish.

UNITED CHROMIUM, INCORPORATED

100 East 42nd St., New York 17, N. Y.
Detroit 20, Mich. • Waterbury 20, Conn.
Chicago 4, Ill. • Los Angeles 13, Calif.
In Canada:
United Chromium Limited, Toronto 1, Ont.

Plant switching to Unichrome SRHS Chromium Solution increases output 66% — slashes rejects, saves power

The experience of a well known plant exemplifies one of the easiest, most economical and successful ways to "expand" a chromium plating department, or reduce its operating costs.

With the ordinary chromium bath, tank load was limited to only *six* bumpers because of current supply and coverage problems. Even at this rate, rejects due to coverage failures were running high.

Changing the bath to Unichrome SRHS Solution worked wonders. Results with this up-to-date bath were actually better — and cheaper, of course — than *physically* expanding this plant's capacity. *Ten* bumpers could be plated per cycle—a 66% increase in output. Coverage improved so strikingly that rejects dropped drastically.

ADVANTAGES CONFIRMED

This is no isolated case of improvement in operations. Many reports verify that Unichrome SRHS Chromium Solutions provide new economy in plating, better coverage and increased productive capacity.

For example: SRHS increased bumper plating 33% at another plant. . . . It reduced bath upkeep costs 40% for still another user. . . . It hard plated work formerly requiring 3½ to 4 hours in only 2½, producing fewer rejects and substantial savings in grinding time as well.

Simply by making up self regulating high speed Unichrome Chromium Plating solution, tanks used formerly for the ordinary solution can do more work.

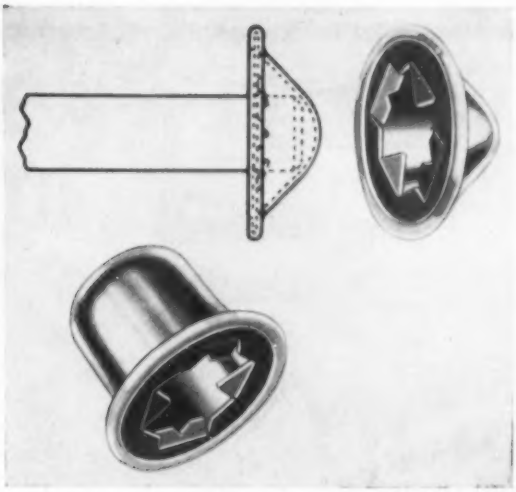
EASY OPERATION

Because important constituents of Unichrome SRHS Baths are automatically controlled, operation is easy and dependable. The SRHS wide bright plate range avoids "burns" and "misses" on the work. These and other advantages are more fully discussed in Bulletin SRHS-2. Send for it.

Circle No. 70 on Reader Service Card

15 Ideas

for using spring-type fasteners to assemble die castings



HOW TO REPLACE COSTLY ACORN OR FINISH NUTS
Cap-type, push-on Speed Nuts slip over integrally molded shafts, studs and similar parts to provide positive locking action and cover unsightly shaft ends.

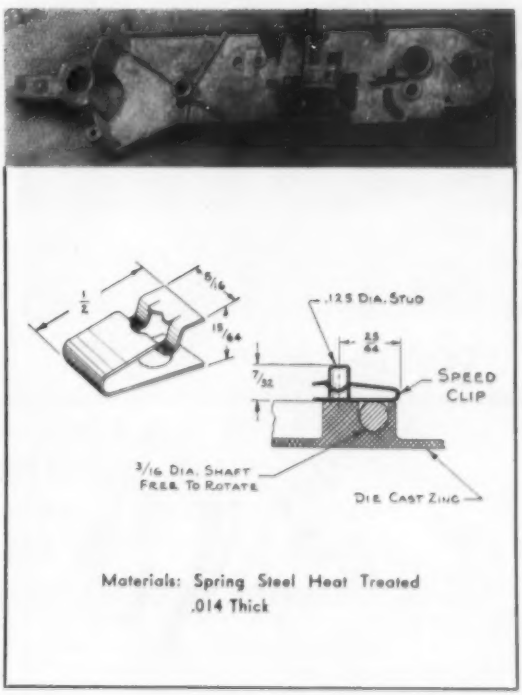
FASTENING is one of the important cost items in planning any product. The designer who plans his product with fastening methods in mind may be able to reduce the cost of assembling substantially by using the most appropriate type of fastener.

Certain fastening techniques are "naturals" for assembling die cast products. When a designer can put one or more of these methods into his product, he will find fastening costs reduced.

One fastening method which is specifically useful for the assembling of die castings is the use of spring type clips such as the Speed Nuts made by Tinnerman Products, Inc. These are made to grip without the need for threads or other machined details.

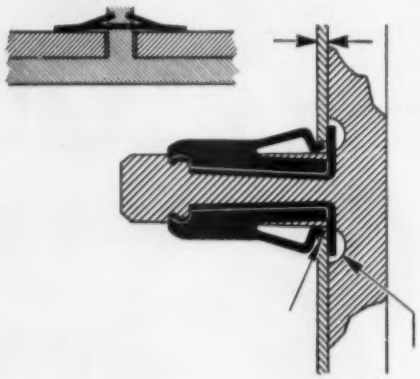
Their applicability as die casting fasteners comes from the fact that die castings can be made with studs, bosses or cored holes which are accurate enough in size and location to permit rapid use of spring fasteners without any machining to prepare the castings.

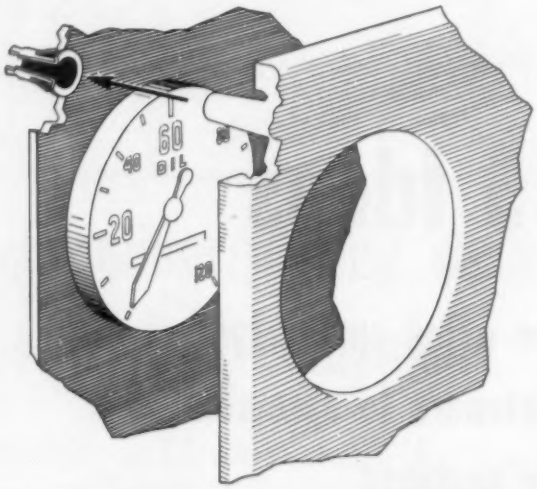
Shown here are 15 ideas for designers typifying the many ways in which spring type fasteners can be used to save fastening costs. This type of assembling device is not only useful when slipped over a boss, although this is certainly the best known application, but it can be used to apply gripping tension against a rotating shaft, to fit inside a cored hole, to slip over an edge, and many other special locations.



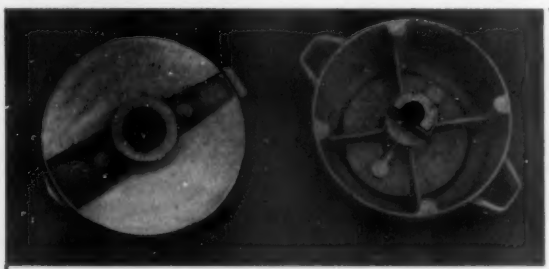
HOLDING A ROTATING SHAFT IN A HOUSING
Special, dual-functioning clip is used to hold firm the stem of a record player control knob situated in a die cast housing, while at the same time allowing it to turn freely on its bearing surface. Clip removes easily by merely compressing spring arms and lifting it off stud (See drawing).

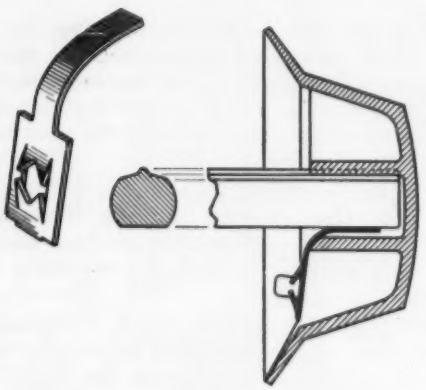
More Ideas On Following Pages

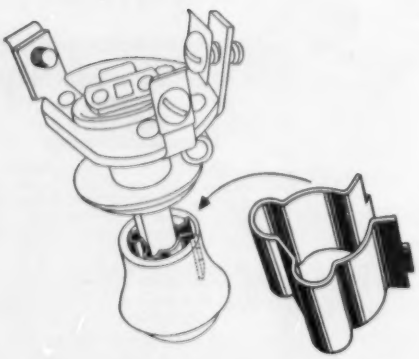


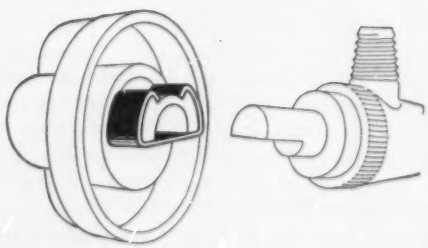


2 WAYS TO FASTEN DIE CAST STUDS IN CORED HOLES
Insertion of tubular-type clip into mounting hole, causes cam-like spring prongs on either side of clip to compress, then spring out to hold fastener in position. Die cast stud is then seated and engages turned-in end of clip which bites into stud to lock it securely. Die cast studs are thus retained in cored holes under live spring tension to hold unthreaded die cast parts.









3 WAYS TO FASTEN DIE CAST KNOBS, HANDLES, ETC.
For attaching die cast knobs, handles, dials, etc., C-type clips are available. Automatic washer control knob, above left, has special C-type clip pressed into center cavity for quick attachment to D-shaped stem of shaft. As knob is pressed over shaft, clip expands to provide three-point contact on shaft and inside of hub. Another type of C-clip fastens a similar control knob to a D-shaped shaft, below right. A third type of fastener for holding a knob on its shaft, above right, is pressed over an integral stud on the knob. The fastener's finger bears against the shaft to give firm, rattle-free attachment.

More Ideas on Page 54

Sensational NEW AUTOMATIC SPRAY DECORATING MACHINE

with no interruption of continuous painting production, automatically washes masks right in the machine and returns them to painting position clean and dry.

No other machine ever required so few masks—only four per operator. Permits tremendous savings in mask investment.

Simultaneously paints two colors on one part or one color on two parts.

Capacity of up to 3,600 pieces per hour, depending upon handling facilities and decoration applied.

Fully adjustable as to amount of paint applied, number of coats and speed of operation. Clean, filtered air is induced for exhausting purposes, and foreign matter is kept from the spray area.

Installation for large toy manufacturer. Work flows continuously and directly from the molding machine to the painting operation, and thence by conveyor to assembly.

ENORMOUS SAVINGS IN COLOR DECORATION OF 3-DIMENSIONAL PARTS

ELECTRO-FORMED METAL SPRAY PAINTING MASKS

(Made by Patented Process)

Permit rapid wet painting, one color after another. Clean, sharply defined letters and decorative effects obtained on intricate die castings, stampings and plastic forms by accurate control of painted areas. No fogged edges. After-wiping or buffing-off of over-spray unnecessary. The "loose" inside of letters and numerals, such as "0" and "6" is held in position by arched bridging to eliminate objectionable "ties". Plug-type masks (keep depressed areas clear, while spraying background); lip-type masks (protect background while painting depressed areas); and block-cutout, plane-surface type masks.

CONFORMING MATRIX CORPORATION

346 TOLEDO FACTORIES BLDG. TOLEDO 2, OHIO

Please send without obligation, details on

( ) Hand Masks; ( ) Mechanical Masking Fixtures; ( ) Automatic, Spray-Painting Masking Machines; ( ) Mask-Washing Equipment; ( ) Quotations on masks for parts (or prints) which I am forwarding.

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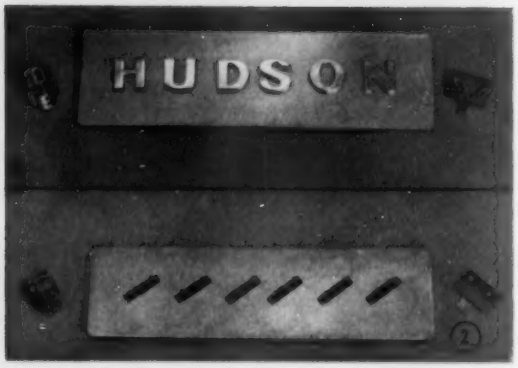
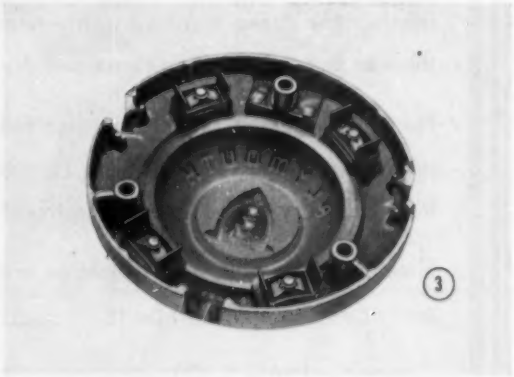
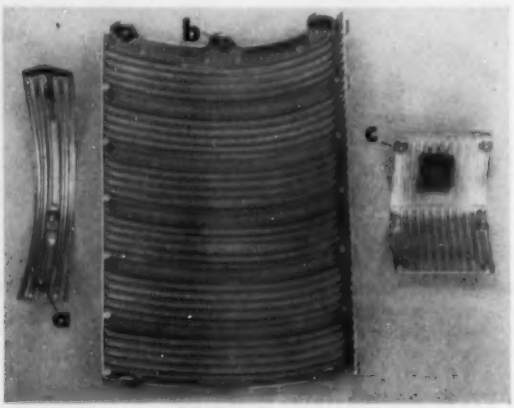
3 WAYS TO FASTEN DIE CAST TRIM

1. Push-on and special tubular type Speed Nuts secure brand insignia to die cast auto nameplate and body trim. Where there is access to only one side of assembly, tubular type clips are used (lower right). 2. Twin-type push-ons are quickly zipped over double studs. Spring arch in center of clip compensates for tolerances between studs. Other multiple push-ons are also illustrated. 3. Turned-up ends of fasteners for fastening trim strip to auto horn button, facilitate installation.







3 WAYS TO FASTEN DIE CAST GRILLES (Left)

Various types of fasteners are used for holding grilles. Tubular type clips (a) at ends of grilles are supplemented by special push-on clip in center. Six self-retaining J-type Speed Nuts snapped by hand over mounting holes in die cast grille (b) hold themselves in screw-receiving position to simplify blind attachment. At right, special push-ons (c) over D-shaped studs need only a quarter-turn for quick removal. Clips are circular with flanges in two locations to help in removal.

HOW TO ASSEMBLE IN BLIND LOCATION (Right)

Nut-retaining Speed Grips (right) are used in blind locations. Top piece is die cast handle for hand tool with fastener set in to retain pressed metal cap. Bottom casting is cutaway portion of die cast outboard motor housing on which costly weld nuts have been replaced for lack of float. This nut retainer is snapped into mounting hole in motor bracket and secures itself in screw-receiving position. This application illustrates excellent resistance to vibration.

HOW TO FASTEN WIRES IN DIE CASTINGS (Left)

Fastening small assemblies or wires in die cast record player arms uses a special type of spring clip.

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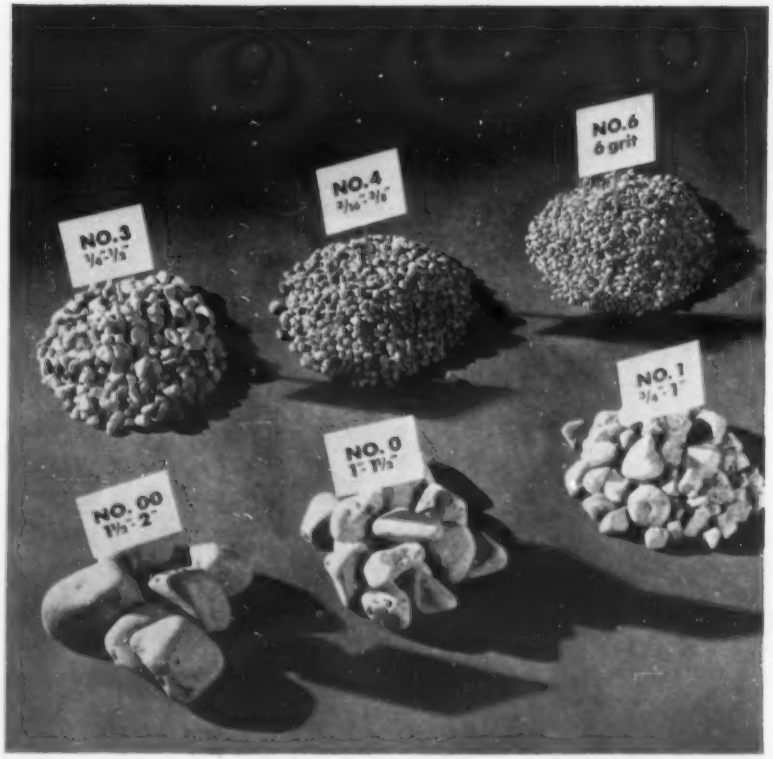
For fast cutting, fine finish, long life...

ALOXITE®

TUMBLING ABRASIVES



CONTROLLED STRUCTURE is the secret of every ALOXITE® Aluminum Oxide Tumbling Nugget... insures uniform, accurate cutting combined with exceptionally long life—20% longer life in many actual tests.

ACCURATE SIZE gives you positive control in every operation... eliminates problems caused by having nuggets too small or too large in the "mix."

COMPLETE RANGE of sizes and types are available, from grain to large nuggets. The tumbled nuggets shown here have had the sharp edges removed to provide more polishing action; untumbled nuggets are recommended for applications requiring higher cutting rates.

ABRASIVE TUMBLING is widely used for low cost precision finishing on parts or products made of steel, aluminum, zinc or magnesium alloys, bronze, brass, and plastics. You can polish, hone, round off sharp edges and corners, remove flash or scale, deburr, remove paint, blend chamfers—and do many other jobs quickly and accurately with ALOXITE Tumbling Abrasives. Are you performing any hand finishing operations that could be done faster and more economically through tumbling?

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83-43

Thread Damage Can Be Prevented

Removable components on portable tools, such as the "dead" handle and oil hole plug, presented a problem. Threads in the cast magnesium tools tended to strip. Here is a report of the remedy found by Rotor Tool Co.

AN effective thread repair method found by Rotor Tool Co., Cleveland, manufacturers of portable air tools, led directly to a design change in its tools. Wire thread inserts, at first used to repair damaged magnesium threads, are now specified as production components to prevent such thread damage.

The redesigned tools, B-12 and B-35, have a feature exclusive with Rotor. The dead handle on the tool is removable and can be used either 90 or 110 degrees from the live handle. This feature makes it possible for the worker to locate the dead handle at the angle most suited to his physical size and work habits. For example, it has been found that a larger man is more comfortable using the tool when the dead handle is at the 110 degree position.

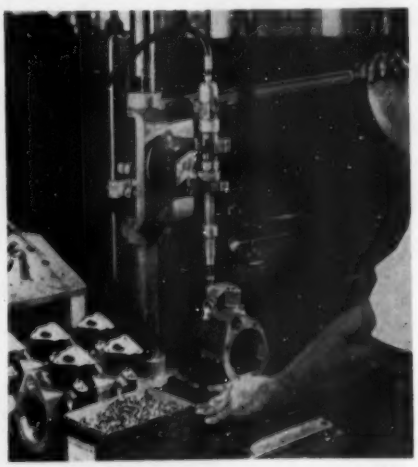
Field experience indicated that the 5/8-in. threads tapped in the magnesium casting for the dead handle were not giving 100 percent satisfaction. Workers who use equipment of this type are not famed for gentleness and the process of removing the dead handle from one location and putting it in the other was sometimes disastrous on the threads.

These tools came back to Rotor with clear evidence that the customers were not happy about this situation.

At this point, Rotor engineers learned that an answer to their problem might be found in the wire thread inserts manufactured by Heli-Coil Corp. Consultation with that company's sales engineers established that installation of stainless steel wire screw thread inserts in the tapped holes in the magnesium casting would provide durable threads that would allow repeated removal and replacement of the dead handle. The result was the specification of 5/8-18 wire thread inserts as original components

Continued next page

Screw-Thread Inserts Are Driven . . .



. . . BY POWER TOOL, shown here installing 1/4-20 Heli-Coil wire thread inserts in magnesium casting for a vertical grinder.

. . . BY HAND, as shown here, by using a simple inserting tool.

for the two tapped holes which receive the dead handle.

The live handle is attached to the magnesium casting with three ¼ in. cap screws. Since maintenance of the tool may require removal of the throttle handle from time to time, it was decided to protect these tapped holes with inserts also. Inserts of ¼-20 size were specified for the three cap screw holes.

In the throttle handle is a reservoir from lubricating oil which is designed to provide oil for the grinder for one shift under normal operating conditions. This reservoir is filled by removing the filler plug, an action that should be taken daily. Success of the insert application in the other tapped holes led to the use of a ⅛-27 pipe thread in the oil plug hole.

Installation of stainless steel wire thread inserts is extremely simple. It only requires: drilling the hole with the correct size of drill, tapping the hole slightly oversize with a Heli-Coil tap, and winding the wire insert into the hole. This produces a permanent thread of the design size. Because they are slightly larger in the free state than the hole into which they are installed, these thread inserts are self-locking in the tapped hole. No amount of vibration or bolt tightening will loosen them.

Use of inserts in the Rotor tools was dictated by most practical considerations. Reduced maintenance, longer part life and increased customer satisfaction were the objectives which were attained by this installation. The dead handle and the oil plug can be removed repeatedly with no concern at all about possible thread damage. If it is necessary to remove the throttle handle it can be re-assembled and the cap screws re-installed with the same degree of accuracy found in the original production of the tool.

NEW LINDBERG BUYER

Lindberg Engineering Co. announces the appointment of C. P. Masure as purchasing agent in Lindberg's newly formed "Field-erected Equipment Division." The new division has been formed to expand facilities for specializing in large, field erected industrial furnaces, special machines and complete production lines.

Masure received his engineering education at the Illinois Institute of Technology and has eighteen years experience in this specialized furnace field where he has served in a management capacity.

Mr. Masure recently resigned from Continental Industrial Engineers Inc.

a good pattern
for you to follow
for dependable, trouble-free
D.C. conversion . . . choose
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SELENIUM RECTIFIERS
A recent survey of plants throughout the nation using rectifiers for DC conversion revealed that SEL-REX units were building up the greatest records in efficiency and dependability.
SEL-REX places no limitation on engineering to achieve the finest DC power plant . . . nor compromise in the choice of components to "bring the cost down". True, such a policy may reflect a slightly higher initial cost . . . but in the long run, a SEL-REX is the most economical. There are no moving parts to wear out, no maintenance expense, no loss of production.
SEL-REX RECTIFIERS are available for every requirement from 25 to 50,000 amperes in completely sealed water cooled or air cooled models.
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now

you can get this brilliant finish directly on zinc die castings!

PART AS CAST

TREATED WITH NEW IRIDITE

No electroplating--no mechanical finishing!

NEW

IRIDITE® (Cast-Zinc-Brite)

brightens zinc die castings by chemical polishing, protects against corrosion

NOW, FOR THE FIRST TIME you can get a brilliant, decorative finish directly on zinc die-cast parts . . . without mechanical finishing, without electroplating! The luster is provided by the *chemical polishing* action of new Iridite (Cast-Zinc-Brite) solution. Even surface blemishes, such as cold shuts, are brightened by this new process. No electrolysis. No special equipment. No specially trained personnel. Just a simple chemical dip for a few seconds and the job is done. And, this new Iridite has been *tested and proved* in production.

CORROSION RESISTANCE, TOO! New Iridite (Cast-Zinc-Brite) provides exceptional corrosion resistance for bright-type chromate finishes . . . also guards against blueing or darkening by eliminating zinc plate formerly required in bright chromate finishing of zinc die castings.

AS A BASE FOR ELECTROPLATING—Lower mechanical finishing costs are possible where plated finishes are *required* since the brightness provided by this new Iridite may be sufficient.

LET US SHOW YOU what Iridite (Cast-Zinc-Brite) can do for you. Send us at least a half-dozen typical zinc die-cast parts for FREE PROCESSING for your own tests and evaluation. Or, for immediate information, call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified 'phone book. *IMPORTANT: when you give us samples for test processing, please be sure to identify the alloy used.*

Iridite is approved under government specifications

ALLIED RESEARCH PRODUCTS
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Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals; ARP Plating Chemicals

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ORGANIZES TUMBLING SUPPLY COMPANY

Clare R. Schuur, co-owner of the Accurate Tumbling Company of Detroit, has organized the Universal Tumbling Supply Company following his purchase of the 200 acre Sturgeon Bay quarry of Sturgeon Bay, Wis.

The quarry for the past 25 years has supplied American manufacturers with tumbling chips used in barrel finishing for de-burring, honing and polishing metal parts.

Clare R. Schuur

The new Universal Tumbling Supply Company is located at 14337 Mansfield Ave., Detroit.

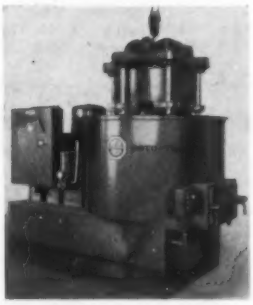
Schuur has been in the tumbling field for the past 15 years. Prior to establishing his parts processing plant, the Accurate Tumbling Company, he was for five years sales engineer for the Sturgis Products Company.

He is a member of the American Electroplaters Society and other technical organizations.

CHANGE PRODUCT NAME

Enthone, Inc., New Haven, Conn. announces a change in the name of one of their standard products. "Enthol" is the new name of the product formerly sold as Enthone Compound 42. This product is an acidic solvent type cleaner utilized for many years by many concerns for the combined cleaning and phosphating of iron, steel, zinc and aluminum surfaces prior to application of organic finishing materials. The product is used either as a wipe-on, brush-on or spray-on type of material.

New Products ... the Reader Service Cards will bring full details



SPECIAL FIXTURE MACHINE
. . . for metal finishing

The original barrel finishing process has been extended to include entirely new special fixtures, machinery and equipment. The new machines are a departure from the generally accepted conception of the tumbling or barrel finishing process.

In the new equipment the fixtured parts are oscillated through abrasive media that remain relatively static. This machine is best suited for finishing parts which are too large to be handled by the conventional type of cylinder machine.

The new unit has proven to be very effective in finishing stampings, forgings and castings such as jet engine compressor and turbine blades.

Fine finishes have been obtained on zinc die castings such as door handles, ornaments, lamp parts, knobs, etc., at a satisfactory production rate.

Since parts must be rigidly fixtured during the finishing operation they must be designed so that they can adequately resist the rather heavy pressures.

Roto-Finish, Inc.
For more information, circle No. 196 on the Reader Service Card

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NEW COMPACTING PRESS
. . . 30 to 500 T range

What is described as an entirely new tableting press has just been disclosed. The new press is capable of making 10

The press is totally enclosed and has both upper and lower punch pressure to assure uniform structure and high density in the compact being formed. Completely automatic in operation, the supply hopper only needs an occasional filling of material. The die fill has handwheel adjustments, and the pressure stroke can be adjusted by a visual indicating scale.

According to the manufacturer, by totally enclosing the operating mechanism maintenance costs are reduced to a minimum.

Kux Machine Co.
For more information, circle No. 197 on the Reader Service Card

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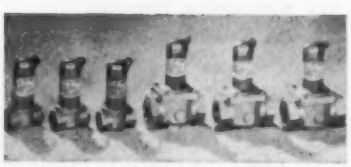

AUTOMATIC CYCLING
. . . with solenoid valves

A complete line of diaphragm operated solenoid valves from ⅜" to 1½" for stand-by control of fluid flow and for automatic cycling operations on machine tools, furnaces, etc. has just been introduced.

The valves may be used for control of air, water, oil, refrigerants, and fuel gases. They will operate on line pressures as high as 150 psi and as low as ½ inch of water.

The valves are supplied with aluminum bodies for gas and air service and with brass bodies for oil and water service. The valve seats and armature pilot plungers are stainless steel.

Eclipse Fuel Engineering Co.
For more information, circle No. 200 on the Reader Service Card

Continued next page

ULTRASONIC CUTTING MACHINE

. . . for cutting, boring hard materials

Equipment that cuts hard materials by vibrating a soft metal die at ultrasonic frequencies has recently been unveiled.

Incorporated into the Ultrasonic Machine Tool, a transducer vibrates a die approximately 25,000 times per second, causing abrasives suspended in a liquid to strike the hard material with 5,000 to 10,000 times their normal weight.

By changing dies, it is possible to make the tool cut any shaped hole that may be desired.

Raytheon Mfg. Co.
For more information, circle No. 201 on the Reader Service Card

REDESIGNED TAPPING HEAD

. . . has longer life, faster operation

New engineering improvements together with a newly developed clutch allows the new tapping and threading attachment to deliver the high speeds and smoothly controlled clutch power necessary for efficient production.

Some of the improvements announced by the manufacturer are a completely redesigned steel clutch, a new synthetic friction material, die cast sealed cases with life-time oil supply sealed in, improved oil distribution across the clutch faces, and a more rigid chuck spindle accurately aligned and supported at both ends.

Ettco Tool Co., Inc.
For more information, circle No. 198 on the Reader Service Card

It's the "*FINISH*" that counts

. . . and when it comes to finishing die castings, you can count on us

We are prepared to handle all of your plating on zinc die castings. We have completely automatic plating facilities suitable for long runs, and we have more than 34 years of experience in plating.

Send for this free booklet

FPCo

THE *Four Plating* COMPANY, INCORPORATED

216-222 Thomas St. • Newark 5, N.J.
Telephone: Bigelow 3-8900-1-2-3-4

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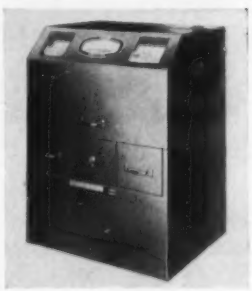
BARREL FINISHING MACHINE

. . . is more easily controlled



A new model, DBO-1A, barrel finishing machine is a compact unit that features less floor space, simplified operation, finger-tip control. Variable speeds are from 8 to 45 rpm and the all-in-one control and drive unit is built-in panel mounted.

Twin barrels are 8" wide by 16" across the flats. Self contained screening drawer for 12—6912—Precision Metal 35-7 loading, unloading, separating parts from media, etc. is featured.

Almco Supersheen
For more information, circle No. 199 on the Reader Service Card

FAST POROSITY TESTING

. . . with new wetting agent

If a suitable wetting agent with adequate sudsing properties is introduced into water used for testing castings for porosity, the operation can be speeded up materially, and the

Continued next page

finer pin holes and microscopic openings which would not show up readily with plain water are quickly spotted.

A new wetting and sudsing agent causes the solution to bubble profusely when used in water testing of castings.

The material is used at about one ounce per gallon of water. Castings are immersed in this solution, and air is introduced into their interiors with all openings plugged. Faulty castings show up immediately, and even the smallest holes due to porosity are detected.

Magnus Chemical Co., Inc.
For more information, circle No. 202 on the Reader Service Card

---

REDESIGNED BENCH GRINDERS ... have improved performance

According to the manufacturer, notable improvements have been made in their 7" bench model grinder and buffer. In both single and three phase motors the new models feature higher starting torque, higher breakdown torque, lower operating costs and greater adaptability.

All single and three phase models (except the 550 volt model) have been changed from single to dual voltage. All single phase motors are now capacitor start instead of split phase. The higher breakdown torque reduces stalling especially in heavy grinding operations. This results in lower labor costs.

Numerous other improvements have been incorporated in the redesigned unit.

Delta Power Tool Div.
Rockwell Mfg. Co.
For more information, circle No. 204 on the Reader Service Card

---

COLOR FILLING, PRINTING ... with ink, enamel and varnish

A new color filling and printing machine for light filling of small parts of metal, plastic and other materials with colored ink, enamel or varnish has been developed for air operation on standard factory air hose connections.

The printing and filling part of the machine is an improvement over the older models made by this company. Aside from the printing unit itself, the machine is entirely new and because of the air power drive it doubles the printing or filling production of the smaller hand model where adaptable and being a larger machine permits feeding of small parts with both hands, two parts being fed and marked at one time when of justifiable nature.

The machine operates on air pressure of 75 p.s.i. or higher. Bench space for the machine is 30 x 12 x 8 inches.

The Acromark Co.
For more information, circle No. 203 on the Reader Service Card

Continued next page

Good Barrel Finishing Costs Less with The Abbott Method

It's a fact! The Abbott Method of Barrel Finishing reduces costs because it features long-lived Abbott Burnishing Shapes. Made of selected carbon steel — deep hardened — tempered and polished to a mirror-like glass hard finish, Abbott Shapes make efficient contact on all sizes and designs of stampings and castings. Abbott Burnishing Shapes last longer, burnish more parts and cost less in the long run. Used in Abbott Vertical Barrels they make an unbeatable barrel finishing combination!

For Proven Performance . . . use The ABBOTT METHOD.

Improved Abbott Barrel!
Self-contained! Precision speed control! Color dynamic! Write for details . . . quick!

ABBOTT

THE ABBOTT BALL COMPANY
1084 NEW BRITAIN AVE.
HARTFORD 10, CONN., U. S. A.

Circle No. 57 on Reader Service Card

IMPROVED CUT-OFF MACHINE . . . features power feed

Available as either an accessory for present saws or as optional equipment on new saws, a semi-automatic power feed has been developed for Stone cut-off machines.

The feed operates on chop-stroke type saws and is air-operated with one simple control. The manufacturer states that tests showed that the power feed cutting head will increase production, eliminate operator fatique, and increase wheel life 10 to 25 percent depending on the metal being cut. With the new feed a uniform cutting rate of four seconds per square inch of metal cut is maintained.

Stone Machinery Co.
For more information, circle No. 205 on the Reader Service Card

BARREL FINISHING MACHINE . . . has twin barrels

Occupying little more floor space than a single barrel machine of half the capacity, a new finishing machine is now available that features a pair of 2 cu. ft. barrels, twice the capacity of previous twin models.

The machine features sealed ball bearing construction, variable speed drive from 12 to 36 rpm, a ¾ HP 220V, 3 phase motor, water tight push-button starter and heavy gauge steel hexagonal barrels.

Moveable chutes are provided for draining and unloading. When the chutes are tilted to the drain position they also act as adequate safety guards. Barrels can be lined with vinyl plastic as specified.

Rampe Mfg. Co.
For more information, circle No. 206 on the Reader Service Card

SMALL TUMBLING BARREL . . . for bench operation

A new tumbling barrel, built entirely of steel, and occupying only 14″ x 24″ of bench space has been put on the market.

The unit carries a 7½″ x 12″ plastic lined steel drum mounted on double shafts rotating in self-aligning ball bearings. The drum door is 6″ x 7″, 3/16″ thick and neoprene lined.

The unit is powered by a ¼ HP motor operating on 115 volts, 60 cycle current. Two different speed controls are available, one a three step pulley gives three speeds of 19, 35 and 58 rpm. The other transmission is infinitely variable from 0 to about 65 rpm in either direction.

Lord Chemical Corp.
For more information, circle No. 207 on the Reader Service Card

FINGERTIP VALVE . . . for four-way air operation

This four-way valve in ¼ pipe size is similar to the three-way valve made by the same company. Openings give ample speed for most jobs with air cylinders up to 3 inch bore. Because of its light touch, these valves have been likened to the operation of telegraph keys, only about ⅛ inch movement being required from full open to closed position. Lever returns to starting point after each release. Twin mounting holes on top and sides make the valve easy to mount in any position.

Mead Specialties Co.
For more information, circle No. 208 on the Reader Service Card

Continued on page 66

It's practically
WATER-WHITE
a NEW
chemically resistant
baking finish—
DURACHEM
For all types of metal products from heavy hardware to fine jewelry

Here is a new baking type synthetic finish for metal parts that combines unusual clarity with a high degree of chemical resistance.

Product of Maas & Waldstein Co. research, DURACHEM is almost water-white in color—and retains its clarity even after prolonged exposure to heat and sunlight. It also protects metal parts against the effects of salt spray and perspiration.

Typical applications include builders' hardware, vanity and cosmetic cases, lipstick shells and pen caps.

Where decorative color effects are desired on metal, DURACHEM can be supplied in a range of colors with the same chemical stability as the clear finish.

Samples and technical literature are available on request. Or an M & W technical consultant will discuss your requirements privately with you.

MAAS & WALDSTEIN CO. 2113 McCARTER HIGHWAY NEWARK 4, NEW JERSEY
Midwest Div., 1658 Carroll Ave., Chicago 12, Ill.
Pacific Coast Div., Smith-Davis Co., 10751 Venice Blvd., Los Angeles 34, Calif.
MANUFACTURERS OF INDUSTRIAL FINISHES

Circle No. 64 on Reader Service Card

Product Facts

Catalogs · Manuals · Brochures

PROCESSES

Nickel & Nickel Steel: 144
Inco Nickel Topics, a publication of International Nickel Co. is devoted to items of interest to the user and potential user of nickel and nickel alloys, including nickel bearing steels.

What Can and Cannot be Investment Cast: 145
In an 11 page booklet, originally published for their sales force, the Vascoloy-Ramet Corp. gives much comprehensive information on investment casting. Particularly important is the section explaining the limitations of investment castings.

Stock Bearing List: 14
More than 600 widely used sizes of oil retaining porous bronze bearings are listed by size in the latest edition of the Bound Brook "Compo" bearings stock list No. 4. The list is based on the most popular stock sizes, and is designed to save the user time by eliminating sizes that are less frequently used. Useful condensed information on application, installation, lubrication and machining is also included.

MATERIALS AND EQUIPMENT

Industrial Waste Treatment: 150
Bulletin WC-116, published by Graver Water Conditioning Co. describes the equipment, gives flow charts, and other pertinent information on treatment of industrial wastes.

Ethyl Silicate in Investment Casting: 151
A new comprehensive guide to the use of ethyl silicate as a refractory mold binder in investment casting has been prepared by Carbide and Carbon Chemicals Co., a division of Union Carbide and Carbon Corp.

Hydraulic Components Catalog: 152
A condensed catalog of the hydraulic components manufactured by the company has been issued by the Hydraulic Press Mfg. Co.

Permanent Mold Casting Machine: 153
A folder describing the Lindberg Wessel casting machine for casting in either metal or graphite molds has been prepared by the Lindberg Engineering Co.

High Strength Aluminum Alloy: 154
The properties of Ternalloy, an aluminum base alloy series for high-strength castings without heat treatment, are given in a new file-folder brochure prepared by Apex Smelting Co.

Punches & Dies: 155
A pocket-size manual on punch and die materials, how to specify and other facts concerning punches and dies for all types of tabletting are given in a new brochure published by the F. J. Stokes Machine Co.

Technical Booklet: 156
The Cooper Alloy Foundry Co. has published a technical reference booklet consisting of 11 reference sheets covering the major stainless alloys. Composition, mechanical and physical properties, corrosion resistance, etc., are given for each alloy.

Crucibles for Melting: 157
The first of a series of pamphlets, entitled "Crucible Charlie Says," to be used by the Crucible Manufacturers Association gives information on and about crucibles for melting, etc.

Metal Supply Source: 158
Commemorating 50 years of service to the foundry industry, U. S. Reduction Co. has issued a colorful brochure describing the plant, its growth and present facilities.

Melting & Holding Furnaces: 159
A completely new line of melting and holding furnaces, specifically designed for die casting and permanent mold casting is now being built by Eclipse Fuel Engineering Co. Descriptive literature on these units is available.

Reference List of 'dag' Dispersions: 147
Physical properties and typical applications of 40 different 'dag' industrial dispersions of colloidal graphite, molybdenum disulfide, vermiculite and zinc oxide are listed in a new reference sheet offered by Acheson Colloids Co. These include not only lubricants for die casting dies and permanent mold casting, but a very wide variety of lubricants, conductive coatings, cathode ray tube coatings and other special-purpose dispersions.

FINISHING

Midget Mills & Burrs: 160
Severance Tool Industries, Inc. offers two new catalogs listing many of their high speed and cemented carbide burrs and midget mills.

Blast Cleaning: 161
The house organ of the Pangborn Corp. is distributed quarterly to all persons interested in blast cleaning and dust collecting.

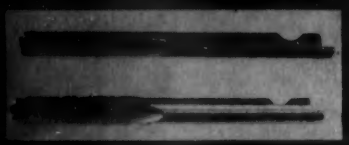
Spray Painting Economy: 162
A detailed motion study of spray painting has been made by the DeVilbiss Co. to show how spray painting can be done with maximum economy and minimum operator fatigue. Copies are available to users of spray painting equipment.

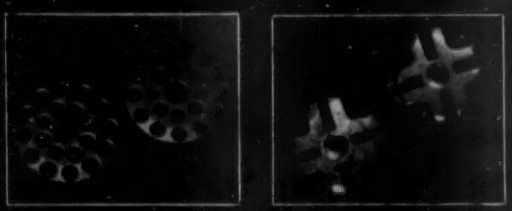
Continued on next page

ALMCO
Supersheen
SPEED FINISHING
ALBERT LEA, MINN.

BARREL FINISHING
ABRASIVE
COMPOUNDS

THE RIGHT COMPOUNDS FOR YOUR SPECIFIC NEEDS—WITH THE RIGHT CHARACTERISTICS FOR BEST RESULTS





Supersheen Abrasive Compounds are formulated for use with *all types* of barrel finishing machines—they produce an infinitely *superior* grinding action—and can be used with *all types* of chips or metal media. They will increase the cutting action of any chip—and long-lasting qualities reduce your compound cost.

Send today for complete details of Almco Supersheen Compounds. Over 40 different standard types.

ALMCO Supersheen
AMERICA'S LARGEST MANUFACTURER OF ADVANCED BARREL FINISHING EQUIPMENT—MATERIALS AND COMPOUNDS
ALBERT LEA, MINNESOTA

Circle No. 59 on Reader Service Card

Airless Blast Cleaning: 163
Bulletin No. 114-B of the American Wheelabrator & Equipment Corp. describes the equipment and the many uses of the company's Tumblast machines.

Plastisol Compounds: 164
A line of plastisol compounds is now being marketed by United Chromium Corp. These materials may be used for coating, casting or modeling. Series 4000 and 5300 are said to produce coatings and castings with the best features of chemically inert vinyl plastics and rubbers. Bulletin VP-1 describes them.

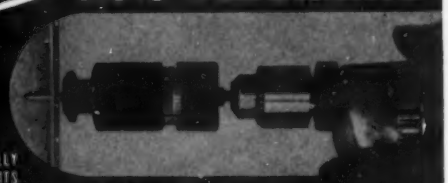
Phosphatizing under Silicone: 165
All of the protective advantages of a phosphate coating can now be applied under normal silicone finishes, according to literature recently issued by The Diversey Corp.

Electroplating Equipment: 166
The Udylite Corp. has a 24-page general bulletin covering, in detail, the products, the research and laboratory service and the plating room supplies of the company.

Rust Preventative and Stopper: 167
A new product is being marketed by Wilbur and Williams Co. said to stop rusting and prevent rust formation. A brochure describing the material is available.

Continued on next page

NOW AUTOMATIC
Hole DEBURRING



AUTOMATICALLY DEBURRS PARTS LIKE THESE!

with NOBURMATIC TOOL

New Noburmatics deburr and chamfer front and inaccessible back hole faces in ferrous and non-ferrous sheets, plates, extrusions, castings and forgings ***in one automatic operation.*** Used in drill motors or stationary machine tools, Noburmatics produce uniform deburring with high accuracy, increase production line speed. Made in all drill sizes from ⅛" (.125) to F(.256).

Entry Noburmatic enters hole, advances to limit stop, DEBURRS FRONT FACE. (Rear cutter now projects.)

Withdrawal BACK FACE DEBURRED. Cutter automatically retracts. Tool ready for next cycle.

For Free Bulletin and Full Details, Write Today!

NOBUR MANUFACTURING COMPANY
717 N. VICTORY BLVD. BURBANK, CALIF

Circle No. 65 on Reader Service Card

Metal Cleaning: 168
In a 60-page booklet, Oakite Products Co. gives a group of case histories and applications of metal cleaning products made by that company.

Electroplating Rectifiers: 169
An eight-page booklet has been prepared by Wagner Bros., Inc. describing their electroplating rectifiers and the research and service facilities of the company.

Abrasives For Non-ferrous Metals: 170
A new booklet describing the use of coated abrasives for grinding and finishing nonferrous metals is available from Minnesota Mining and Mfg. Co.

Corrosion Protection and Paint Base: 171
The American Chemical Paint Co. has published a folder describing Alodine No. 1200 for applying a protective coating to aluminum and also to serve as a paint base.

Selenium Rectifiers: 172
United Chromium, Inc. has published a new brochure describing their selenium rectifiers for electroplating and other work requiring d.c. power sources.

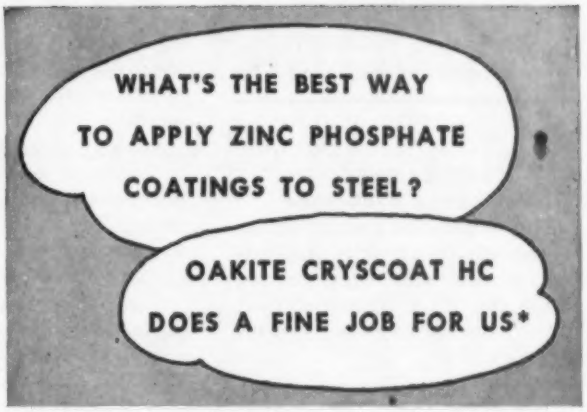
Coated Abrasives Handbook: 173
A completely revised, 36-page booklet on coated abrasives is now available from Clover Mfg. Co. This book contains valuable technical information on the choice and uses of coated abrasives.

New Degreasing Solvent: 174
A work sheet describing a new degreasing solvent has been prepared by Octagon Process, Inc. The new solvent is used cold and can be redistilled dozens of times. Recommended in place of vapor degreasing for the removal of light oils.

Washing Machine for Castings: 175
In a four-page, informative brochure, International Conveyor and Washer Corp. describes and pictures its new, fully automatic, indexing fixture-type, three stage, precision industrial washing machine. According to the information available, the machine is specifically designed for high production washing of intricate castings.

Broach Sharpeners: 176
A complete line of broach sharpeners for round and flat broaches and universal broach sharpening has been detailed in a new four-page bulletin (No. S-54) by the Colonial Broach Co. The bulletin points out the various design features of the Colonial Broach sharpeners and goes into considerable detail on each model with regard to operating details.

Acid Resistant Coating: 177
A four-page bulletin (No. 121) has been issued by Carboline Co. giving the results of 60 different coating systems, applied on rusty steel panels, and exposed to 7 percent sulfuric acid mist at 130°F. Finishes tested were rubber base, vinyl, mastics, polyvinylidene chloride, polystyrene, epoxy, methacrylates, polyester and neoprene.



*This comment came from a Pennsylvania munitions maker, who added that Oakite CrysCoat HC has put an excellent zinc phosphate coating on 385,000 shells with "absolutely no trouble . . . maintenance and control are very easy."

The Oakite CrysCoat HC coating on steel products—such as artillery shells, rocket fins, auto parts, etc.—weighs more than 200 milligrams per square foot. It more than meets the requirements of U. S. Government Specifications:

JAN-C-490, Grade 1 57-O-2C, Type 2, Class C
PA-PD-191, Rev. A

The Oakite CrysCoat HC Process for preparing steel for painting—either in spray-washing machines or in tanks—has five big advantages:

1 The heavy CrysCoat HC coating forms a strong foundation for the lasting adhesion of paint. *See page 5 in free booklet.*

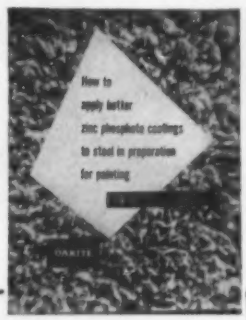
2 The heavy coating gives excellent protection against electrochemical corrosion. *See page 7.*

3 The CrysCoat HC Process is easy to control. Only one material is used for make-up and up-keep. No accelerators, starters, toners or other additives are needed. Only one simple type of titration is used. *See page 9.*

4 The CrysCoat HC reaction produces relatively little sludge and scale. *See page 10.*

5 Stainless steel is not necessary for all parts of the equipment. *See page 11.*

FREE For complete information, mail the coupon for a copy of our 12-page illustrated booklet describing the Oakite CrysCoat HC Process.



SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. and Canada

OAKITE PRODUCTS, INC.
340 Rector St., New York 6, N. Y.

Send me a FREE copy of *"How to apply better zinc phosphate coatings to steel in preparation for painting."*

Name _____

Company _____

Address _____

Circle No. 67 on Reader Service Card

NEW PRODUCTS
continued from page 62

SALT SPRAY CABINET
. . . gives close duplication

Said to give test results within 10 percent of absolute duplication, a new salt spray cabinet called the "H-T Sincolite" Salt Spray Test Cabinet has been introduced.

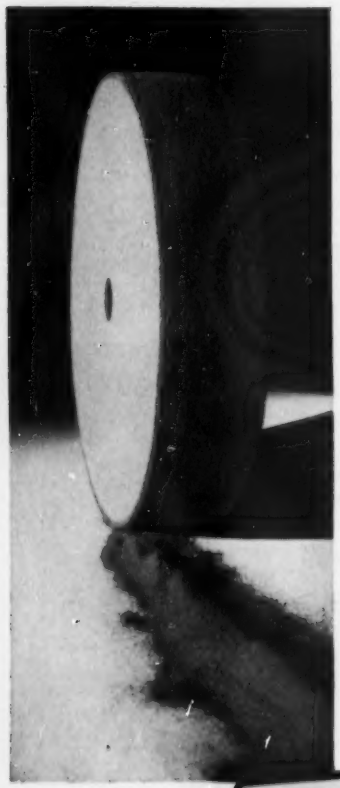
The new spray cabinet meets A. S. T. M. Spec. B-117-49T and the intent of other government specifications for similar equipment.

Its high degree of uniformity is obtained because it has no parts of contaminating materials susceptible to corrosion exposed to test solutions or vapors, according to the manufacturer.

Completely transparent, the cabinet affords clear visibility for observing and controlling progress of tests, and examining specimens from all sides without opening the lid. Fusion welded construction provides permanent no-leak seams, and the manufacturer claims that complete elimination of deterioration and maintenance extends the service life indefinitely.

G. S. Equipment Co.
For more information, circle No. 209 on the Reader Service Card

How ALUNDUM grain adds the profit-boosting* **"TOUCH of GOLD"** *to all your polishing wheel operations*



Norton ALUNDUM abrasive grain is extremely hard, tough and sharp. It is uniform in chemical composition, crystal structure and grain size — no oversize grains to mar the surface, no undersize grains to loaf on the job. Its high capillarity, produced by special Norton processing, means easier wetting with the glue and assures stronger, faster cutting, longer lasting wheel heads.

And you can get ALUNDUM *grain in exactly the grain shapes and surface treatments you need to add the product-improving, money-saving "Touch of Gold" to every step of polishing, with every type of wheel and on every metal.*

Watch your setting up temperatures!

Cold wheels and cold abrasive grain jell the hot glue too rapidly, which reduces its adhesiveness and prevents sufficient pickup of grain, resulting in slow cutting, hot running wheel heads. To guard against this, pre-heat wheels and grain to between 100° and 120°F, so the glue solution can be applied at a temperature of 140°F. Also, hold the setting up room temperature around 80°F, use uniform pressure when rolling wheels in the grain trough.

Further helpful information on setting up — including the selection of ALUNDUM grain, preparation of glue, use of cement, drying operations, wheel types, polishing different metals, etc. — is contained in the Norton booklet *Setting Up Metal Polishing Wheels and Belts.* Your Norton Distributor can supply it, and can make quick deliveries of ALUNDUM grain. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

Making better products . . . to make other products better

NORTON

and its **BEHR-MANNING** *division*

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

Circle No. 68 on Reader Service Card

TOOL SHOW BRIEFS
continued from page 46

Industrial Fasteners . . .

"It is safe to say that an important part of all human labor in factories is spent in applying fasteners. My best advice to you is be aware of the flexibility of the fastener industry. It will be surprising, indeed, if you don't find a better and more economical way of fastening your equipment."

W. G. Stewart, technical advisor, Industrial Fasteners Institute

Cermets . . .

Wedding clay and metal has solved production problems for jet aircraft. "Conventional alloys simply won't do because they drop off markedly in physical properties at about 1700F." Powder metallurgists solved the problem by developing new materials called "cermets" which withstand temperatures ranging from 1700 to 2500F.

George Stern, vice president, American Electro Metal Corp.

Powder Metal Savings . . .

Proven cost savings of 77 percent have been achieved by using powdered metals, molded under pressure, to make components for toy locomotives.

J. F. Kuzmick, president, Welded Carbide Tool Co.

White Collar Foundries . . .

Automatic shell molding foundries have been designed

that can produce as many molds in an eight-hour shift with one-quarter to one-third the manpower needed in conventional mechanized foundries for the same production total. The "white collar" foundry is no longer farfetched.

L. J. Bishop, vice president, Mechanical Handling Systems, Inc.

Induction Heating . . .

Cheaper steel is replacing high-price alloys in many cases because induction heating can give it surface strength equal to the alloys.

C. E. Glick and P. N. Sorenson, TOCCO Div., Ohio Crankshaft Co.

Problems of Titanium . . .

A major problem in machining titanium is its poor heat conductivity. The heat from the machining process is localized at the point of work, causing tool damage. Carbon dioxide is being used for broaching titanium successfully and may lead the way to an overall solution.

G. T. Fraser, sales manager, Rem-Cru Titanium, Inc.

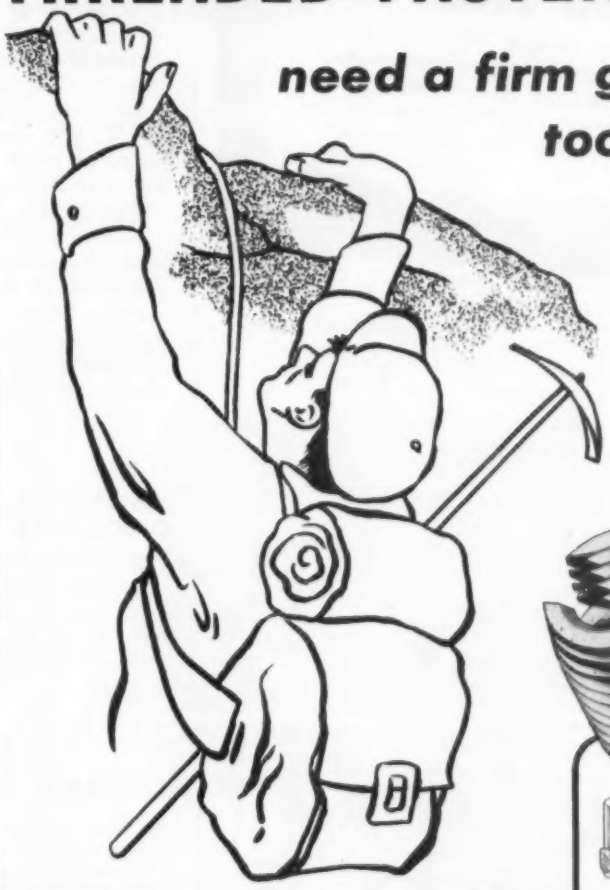
NEW NET PRICING PROGRAM INTRODUCED BY NORTON

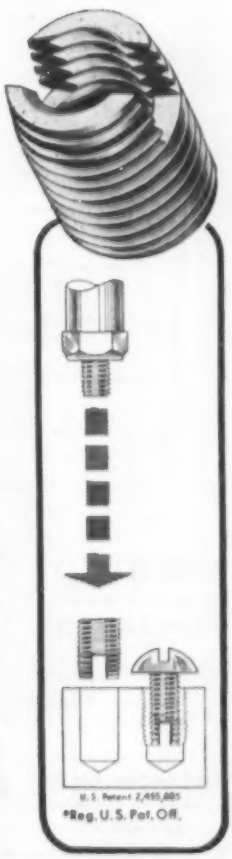
Breaking a tradition of long standing in the Abrasive Industry, Norton Company has just instituted net pricing to make it easier to buy grinding wheels.

Announced April 28 by Donald L. Price, sales manager, Abrasive Division, in a letter to all Norton distributors, this new "net unit price program" means that a distributor or customer can determine the cost of a grinding wheel, segment, brick, stick or mounted point without resorting to former time-consuming procedures of applying multipliers to tabulated "list" prices to calculate "net" prices.

Considered the simplest pricing system in the abrasive industry, net prices for over 25,000 stock items ranging from tiny mounted points to huge crankshaft wheels can now be quoted quickly and conveniently for any listed size, shape, grain or grade of grinding wheel in any quantity.

THREADED FASTENERS need a firm grip, too!





The strength of a threaded fastener often affects the success or failure of a mechanical product —it may even mean life or death.

Many of today's structural materials need a hard bushing to strengthen the tapped thread against excessive wear and stripping. TAP-LOK* Inserts have gained wide preference in industry for this purpose because: **they tap their own threads • no crossing of threads is possible • only one tool is needed • no secondary operations are required • they have maximum torque-and-pull resistance • unskilled labor can easily apply them.**

TAP-LOK Inserts are steel or brass bushings threaded externally to tap into drilled or cored holes equal in size to tap drill holes that will accommodate the external thread. They are supplied with standard internal threads to receive the male threaded member. Cutting edges at the slotted segments accomplish the tapping operation.

TAP-LOK Inserts are used in volume as original equipment, in production salvage, and in maintenance.

Send for descriptive folder

•

Also manufacturers of Groov-Pins for positive locking press fit.

GROOV-PIN CORPORATION

1122 Hendricks Causeway Ridgefield, New Jersey

Circle No. 71 on Reader Service Card

JOBS WANTED

I'm a high pressure triplex pump built for the toughest hydraulic power application you have. Pick the worst, give it to me, and you can forget you ever had a problem. Top references furnished.

Dear Sirs:

I'm a high pressure triplex pump built originally to work in the oil fields. Have served there 20 years in more than 1,000 jobs. Normally run 24 hours a day and frequently go a week or more without ever being looked at.

Have found this ruggedness pays off BIG in metal extruding, rubber molding, metal forming, and in various process applications.

My specialty is high pressure power (1,000 to 20,000 psi) and will deliver it with virtually no maintenance cost or down-time. If you need a hydraulic power source you can install and forget, why not check my references?

KOBE
HIGH PRESSURE
TRIPLEX PUMP

Send for Complete Data KX-1

Gentlemen:
Please send me complete information on KOBE Triplex Pumps.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

KOBE INC.
HUNTINGTON PARK, 3040 E. SLAWSON AVE. CALIFORNIA

Circle No. 31 on Reader Service Card

LIGHT METAL CASTINGS PROGRAM TO BE OFFERED BY M.I.T.

A special program in casting of light metals will be offered August 23 through September 3 during the 1954 Summer session at the Massachusetts Institute of Technology.

Howard F. Taylor, professor of metallurgy at M.I.T., will direct the two-week program, assisted by other members of the M.I.T. staff and guest lecturers from industrial and research organizations.

Subjects to be covered include metallurgy of melting and casting light metals, mechanism of solidification, behavior and control of gases in metals, gating and risering, heat treatment of light metal castings, welding of light metals, inspection and repair, and chemistry and mechanics of molding materials.

AMERICAN ZINC REELECTS DIRECTORS

Following directors, whose terms expire this year, have been reelected by American Zinc, Lead & Smelting Company to serve until 1957: Erle V. Daveler, Alwin C. Eide, Edward M. Hamlin, Howard I. Young and Richard A. Young.

ELIMINATE SMALL PARTS MACHINING

Five small parts of this machine are plaster mold castings of OPC #40 bronze. Held within specified ±.005" tolerance, they require no finish machining—that's OPC accuracy and smoothness. The "teeth" on the underside of Part D are cast to match the thread of the screw feed—that's OPC preciseness of detail. We'd like to help solve your small parts production problems the same way!

Photo courtesy Hammond Machinery Builders, Inc.

WRITE FOR BROCHURE
Illustrated case histories of savings made by using OPC castings, packed with helpful information.

OHIO PRECISION CASTINGS, INC.
P. O. Box 55—Station A • • • DAYTON, OHIO
Plaster Mold Castings made from
BRASS • BRONZE • ALUMINUM • BERYLLIUM COPPER

Circle No. 43 on Reader Service Card

SHELL MOLD CASTING
continued from page 35

casting. First in line to consider will be the present cost of machining the part in question, how much of this machining can be eliminated in the shell molded casting, what tolerances will be expected and permitted, quantity of castings required each 12 months, what will be the saving in weight, will a better unfinished surface be an advantage? All of the above must be given serious consideration before a decision can be made and plotted against the cost of the pattern equipment and of the finished casting.

A few examples may serve to point out more clearly what we have in mind. A 4" diameter 3¼ pound ratchet with 68 T. on 11⅞ circumference is being produced with a saving of $5.80 per piece. Wearing qualities are improved with the cast iron surface over that of a machined steel surface.

A small cross head slide finished to accurate dimensions by milling at a cost of $.80 each, was supplied in a shell molded casting, eliminating all machining.

Machine time saved in any casting must be considered. It would be economical to use shell molded castings where as little as 30% of machining time can be eliminated. A good share of machining time is in the set-up stage, therefore the actual production in machining time must be very substantial if any machining is to be done at all.

Small runs or samples are very costly. In this early stage of development requests are made for small runs, this does not warrant the tooling costs. A good production run would be about 5000 pieces, not necessarily at one time, but over a reasonable period.

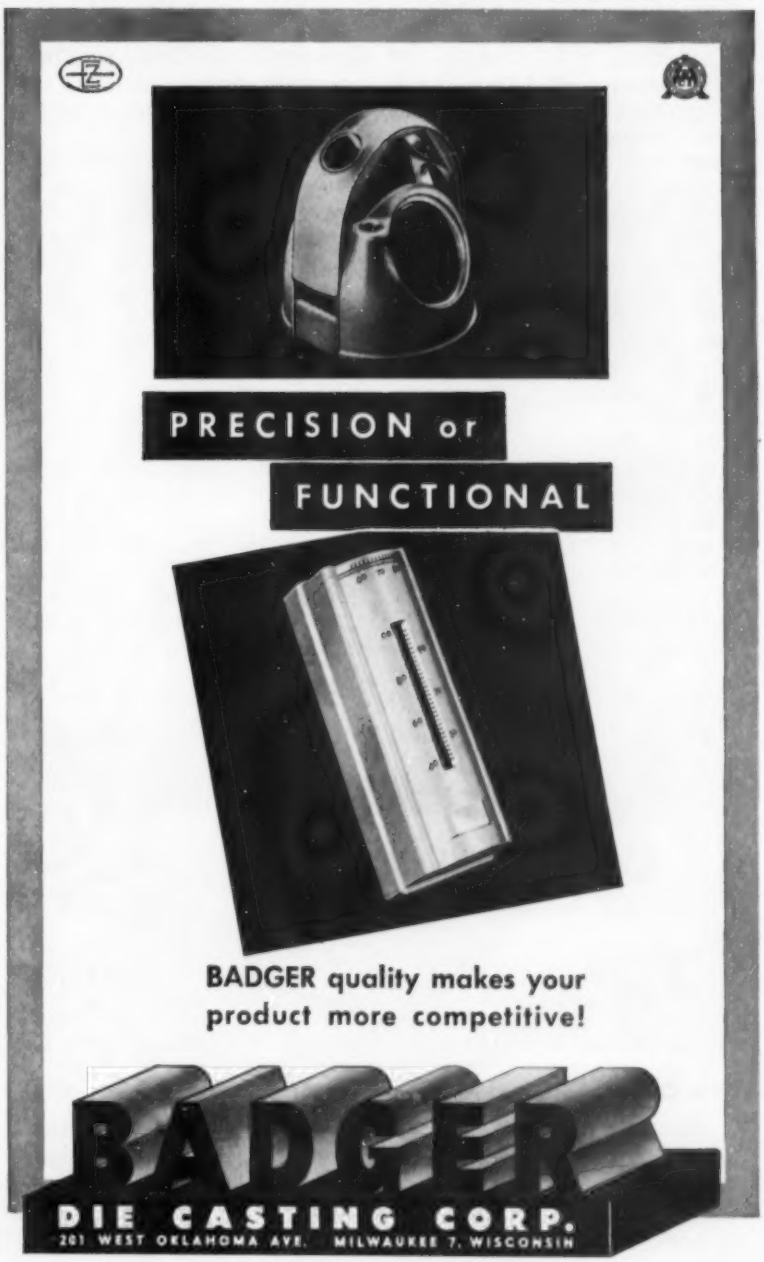
We who are familiar with the possibilities of shell molding believe that within a year or two the jobbing foundry will find it necessary to give strong consideration to the use of at least some shell molding facilities.

We suggest however that only those with the technical ability and the willingness to invest in the necessary equipment get into this method of producing castings. Unless it is gone into with the purpose of establishing a definite addition to the foundry it will be better to stay out of it, because, like the ductile iron process, more harm than good can be done to the trade by those who do not thoroughly understand what is necessary to do a good job.

CEMENTED CARBIDE PLANT INCREASES FACILITIES

Allegheny Ludlum Steel Corporation has completed an expansion and improvement program at its Carmet Division plant in Ferndale, a Detroit suburb, according to C. B. Pollock, vice president in charge of production.

Floor space at the plant located at 1500 Jarvis Street has been increased by 100 percent and the company for the first time is now manufacturing all its carbide powder.



Circle No. 12 on Reader Service Card

Industry News

Companies · Plants · Associations

G. M. Rollason Retires After 35 Years With Alcoa; Managed Company's Die Casting Division

Geoffrey M. Rollason, general manager of Aluminum Company of America's Die Castings division, has retired after 35 years with the Company.

Long a leader in the light metal fabricating industries, Mr. Rollason is currently serving as president of the American Die Casting Institute.

He began his career with Alcoa in 1919 as a research engineer at Cleveland, O. Eight months later, he was named assistant director of research there, and in March, 1920, was appointed manager of the Cleveland foundry.

In 1922, Mr. Rollason became manager of the Company's Detroit works. The following year he transferred to Garwood, N. J., where he later became vice president, director, and then president of the Aluminum Die Casting Corporation, a former Alcoa subsidiary.

Mr. Rollason became plant superintendent of The United States Aluminum Company at Garwood in 1928, and three years later was named its vice president. That company is an inactive subsidiary of Alcoa.

He was named manager of Alcoa's Die Castings division in 1933.

During World War II, Mr. Rollason served on the Die Casting Advisory Committee to the War Production Board.

He is a member of the American Society for Metals and the American Institute of Mining and Metallurgical Engineers, and is a director of the American Die Casting Institute, of which he was elected president in September, 1953.

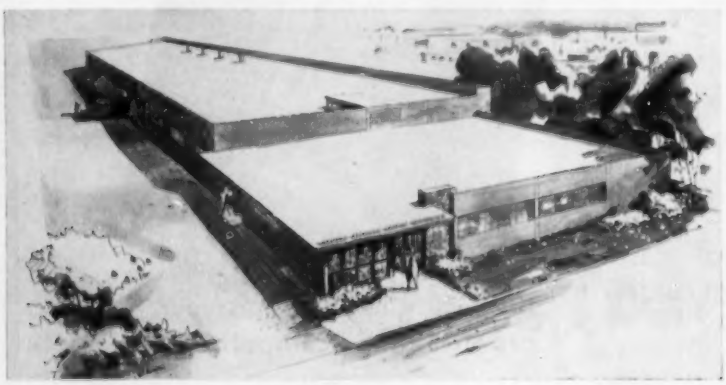
In 1910 he was graduated from Melbourne University in Australia with the degree of Bachelor of Science, and then

G. M. Rollason

came to the United States, where he obtained a degree in chemical engineering from Massachusetts Institute of Technology in 1913.

Upon graduating from M.I.T., he went with the New Jersey Zinc Company of Palmerton, Pa.

With the onset of World War I, Mr. Rollason entered the military service late in 1917, serving as a captain in the Chemical Warfare branch of the U. S. Army.



New California Investment Casting Plant . . . .

. . . is being built by Arwood Precision Casting Corp. of Brooklyn. Architect's drawing for the new plant situated in the eastern part of Los Angeles county, is presented above. Arwood, already operating plants at Brooklyn, Groton, Conn., and Tilton, N. H., expects to have the west coast plant in operation by mid-summer. Building covers about 27,000 sq. ft. on a two acre plot.

ALCOA CONSOLIDATES DIE CASTING DIVISION WITH CASTING DIVISION

Two major operating divisions of Aluminum Company of America—the Die Castings division and the Castings division—have been consolidated, the company has announced.

The consolidation followed the retirement of G. M. Rollason, a veteran of 35 years with Alcoa, who for many years had been

general manager of the Die Castings division.

A. B. Norton, who has been general manager of Alcoa's Castings division will now also direct die casting operations.

H. C. Erskine, who was assistant general manager of the Die Castings division, has been named assistant general manager of the enlarged Castings division.

With these moves, all Alcoa's foundry operations are organized into a single operating division. Previously, the company's two die casting works comprised the Die Castings division while the five foundries in which the sand, permanent mold and plaster casting processes are employed, were a part of the Castings division.

Alcoa's Castings division will now include the die casting works at Garwood, N. J., and Chicago, Ill., as well as aluminum and magnesium foundries and other operations at Cleveland, O., Detroit, Mich., Bridgeport, Conn., Vernon, Calif., and Buffalo, N. Y.

JOEL HUNTER ELECTED TO HEAD CRUCIBLE STEEL

Crucible Steel Company of America has announced the election of Joel Hunter as president of the company to succeed William H. Colvin.

In making the announcement, William P. Snyder, Jr., chairman of the board of directors, stated that Mr. Colvin had expressed the desire to retire from active business life and seek a rest, and that he not be considered a candidate for reelection to the position he had held since 1945. Mr. Colvin will continue as a member of the company's executive committee and board of directors.

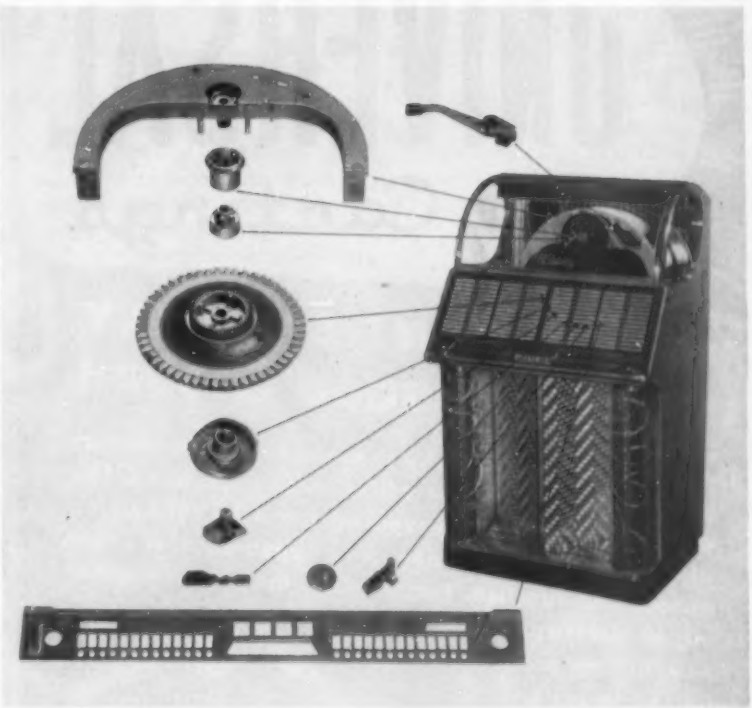
Mr. Hunter joined Crucible in 1951 as vice president in charge of finance and was elected a director of the company and executive vice president in 1953. Previous to 1951 he had been a partner in Haskins & Sells, the company's independent auditors.

ROLLE LICENSED BY AL-FIN

Licensing for the Al-Fin process has been announced by officials of Rolle Manufacturing Company, 301 Cannon Avenue, Lansdale, Pa., one of the largest magnesium and aluminum foundries in the East.

Al-Fin is a patented process for the molecular bonding of aluminum, magnesium, and their alloys to the ferrous metals, nickel, and titanium. It facilitates castings which combine the strength, hardness, and fatigue resistance of the ferrous metals with the light weight, high heat conductivity, excellent bearing properties, oxidation resistance, and other characteristics of the light metals. Patents on the process are held by the Al-Fin Division of Fairchild Engine and Airplane Corporation.

ACCURATE Aluminum, Zinc and Magnesium Die Castings help WURLITZER



...produce an outstanding high fidelity phonograph at lower cost

■ To help maintain its reputation for high quality products that are competitively priced, the Wurlitzer Co. specified ACCURATE die castings. They were sure that every die casting would meet every specification. Cast to close tolerances, these castings required little or no machining, are light in weight, and are ready to use as cast.

Whether it's aluminum, zinc or magnesium die castings, ACCURATE is completely set up to help you with your requirements.

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Howard Foundry Investment Casting Facilities Expanded; Description Of Plant and Equipment

The new investment casting facility recently opened in Milwaukee by the Howard Foundry Company makes available many times the space this division of the large foundry company formerly had.

The trade press was recently invited to attend an Open House to inspect the newly expanded facilities of the company. The equipment, production line arrangements and materials were examined by the group, accompanied by company technical personnel who answered questions and pointed out various production details. Here is a brief reporter's eye view.

Howard uses only wax for their disposable patterns and unhardened low-carbon steel dies. Basic equipment consists of a battery of 16 automatic wax injection machines, equipment for casting sprues and risers in either steel or plaster molds, one 45 foot and one 30 foot assembly line for attaching the patterns to the sprues, investment mixing equipment and two 5 ft. x 5 ft. vibrating tables.

The wax melt out oven was designed by company engineers and is of sufficient capacity to handle the entire output of the uses a 1½ to 2 hour melt out cycle, at a maximum temperature of 350F. All of the wax is recovered and subsequently used to make sprues — no reclaimed wax is ever used in patterns since its shrinkage characteristics become unpredictable.

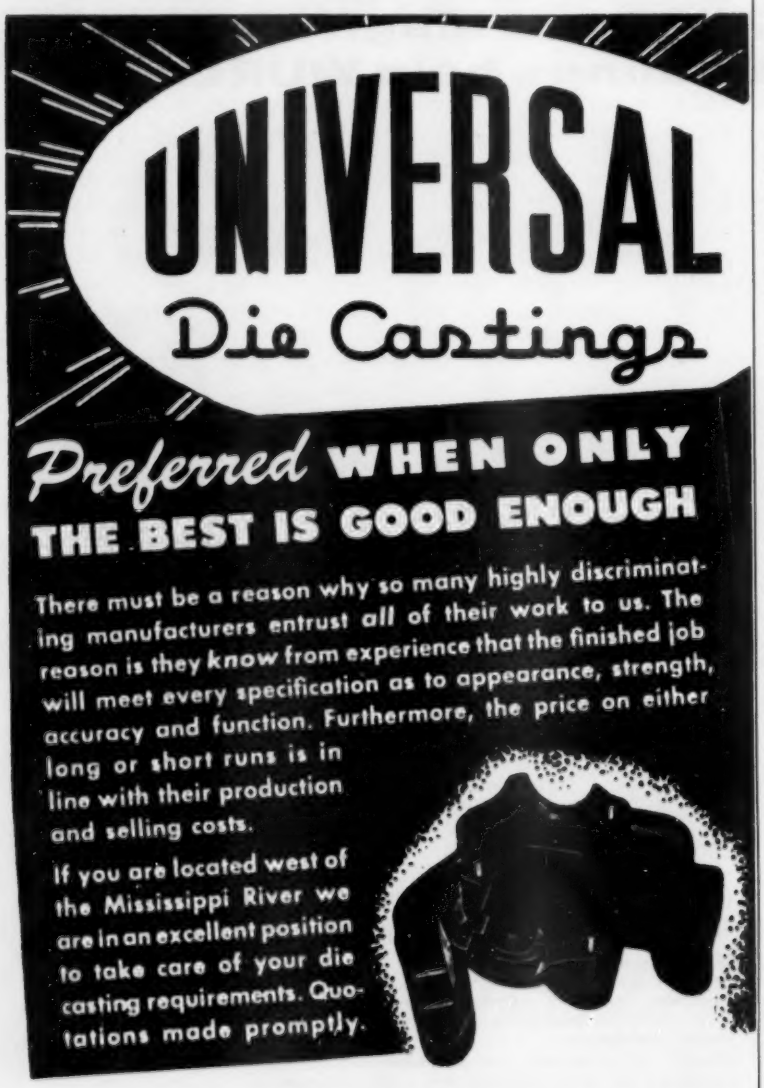
From the melt out furnace the flasks containing the molds go either to temporary storage or to burn-out furnaces. This battery of thirteen Eclipse gas fired furnaces heat the molds to about 1800F (when ferrous base alloys are to be cast) in from six to eight hours. The temperature and the rate of heating of the furnaces is carefully controlled with Brown program controllers.

When the molds are sufficiently cured they are removed from the furnaces while still hot and taken to the pouring stations. Here two Ajax induction furnaces, both 100 KW melt the alloys. Melting and pouring capacity at present is about one ton of steel per 24 hour day.

Shake-out is on Howard designed equipment followed by cleaning in a sand blast.

PMM will present a photo-tour of the Howard investment casting facilities in a future issue.

Continued on page 79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THE BEST IS GOOD ENOUGH
There must be a reason why so many highly discriminating manufacturers entrust all of their work to us. The reason is they know from experience that the finished job will meet every specification as to appearance, strength, accuracy and function. Furthermore, the price on either long or short runs is in line with their production and selling costs.
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Powder Metallurgy Compared With Other Methods

PROCESS	Alloy Freedom	Tooling Costs	Surface Finish	Tolerances	Per Piece Cost	Design Freedom	Physical Properties
DIE CASTING	Limited	High	Good	Good	Low	Good	Limited
INVESTMENT CASTING	Wide	Medium to high	Good	Medium	High	Best	Wide Range
EXTRUDING	Limited	Low	Good	Good	High	Limited	High
SCREW MACHINE	Wide	Low	Good	Good	Low	Limited	Wide Range
GENERAL MACHINING	Wide	Variable	Good	Good	High	Good	Wide Range
MECHANICAL PRESS	Wide	Medium to high	Good	Good	Low	Limited	Wide Range
SHELL MOLDING	Wide	Low to medium	Medium	Medium	Medium to high	Very good	Wide Range
POWDER METALLURGY	Medium	Medium to high	Good	Good	Low	Limited to good	Wide Range

By MAT M. CHECK
Yale & Towne Research Center

(Eds. note: The following is an abstract of a paper presented at the Metal Powder Association meeting in Chicago, April 27, 1954. The paper, in its entirety, will appear in the transactions of the association.)

THE author first set up the factors to be studied in deciding upon a fabricating process. These are: physical and chemical properties, tolerances, design of the part, required surface finish and comparative costs.

The precision processes compared are: die casting, investment casting, extruding, screw machining, general machining, mechanical press stamping, shell molding and powder metallurgy.

Continued next page

When You Think of *Aluminum Ingot*
THINK of
S-G

The sign, S-G, on aluminum ingot means aluminum of uniform quality made to meet the most rigid chemical and physical specifications. Whether it's for permanent mold, sand or die cast you can be sure with S-G ingot.

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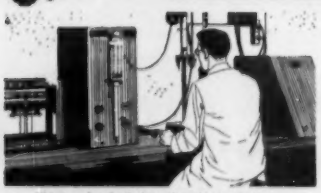
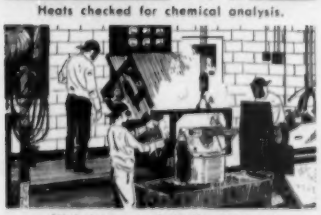
Need pounds or tons of

Custom-made Alloys for remelt or reprocessing?

Call on Cannon-Muskegon



Heats checked for chemical analysis.



High frequency induction furnaces.

Carried in stock are supplies of the 300 and 400 stainless steels as well as carbon alloys. "Specials" including electronic and aeronautical type alloys, tool steels, ferritic, austenitic and super stainless alloys of nickel- and cobalt-base. Available in shot, ingot, billet or cast bars.

Exactly predictable metallurgical control of finished casting is assured by MasterMet control of high-temp alloys, tool, stainless, and carbon steels

You specify the alloy — we'll tailor it to your needs, backed by a *certified* analysis! Name the quantity and the fast delivery will surprise you! Preparation can begin almost immediately after receipt of order. MasterMet "alloy tailoring" gives you all this:

MATCHED ALLOYS TO YOUR MELTING PROGRAM — Close control assures a constantly uniform melt. The results you get from a sample cast are the same as the final production run.

MASTERMET CERTIFIED ANALYSIS—Regularly furnished are notarized certificates insuring alloys that will cast to your exact production specifications.

PRODUCTION MELTS OR SAMPLE JOBS — A combination of test furnaces and larger multiple production furnaces assure completely flexible service at any time.

FAST ACTION ON YOUR ORDERS — No long delays for a mill run. Alloys delivered in drums, clearly marked with all specifications for fast selection and storage.

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Powder Metallurgy — cont.

Included, with a brief description of each process, is an evaluation of tooling costs, per piece costs, metal limitations and process limitations. Pertinent facts on each process are given in the following table. (Note: the tabular presentation is by the abstractor, not the author.)

Special attention is drawn to the fact that every case must be considered as an individual and that no generalities can be drawn.

Improved techniques in powder metallurgy are broadening the application of this process for parts where higher physicals are required, provided the added costs of secondary pressing operations can be borne.

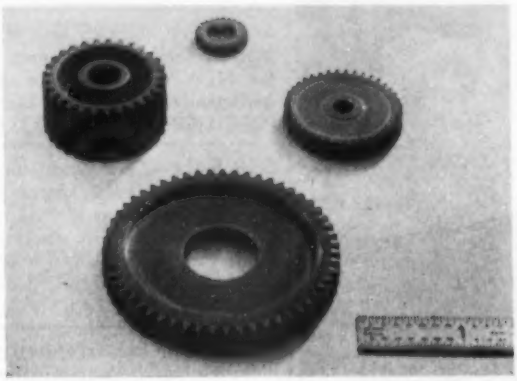
Summarizing the author states: "In our study, we have very definitely found that where the Powdered Metal Process is used in a correct application, the process is one of the best and most economical forms of fabricating when compared with other methods available. Current research and development indicates that the process is ever expanding in its efficient application, especially with respect to physical properties. As these developments come into being, Yale & Towne intends to take every advantage of this swiftly growing powdered metal process."

METAL HYDRIDES, INC., SEES PROFITABLE YEAR 1954

With the completion of a 1¼-million dollar expansion program last year, and an extensive program now underway to study and extend the uses of alloy powders in commercial powder metallurgy, Metal Hydrides, Inc., of Beverly, Mass., foresees another year of profitable operation, according to L. W. Davis, general manager of the company.

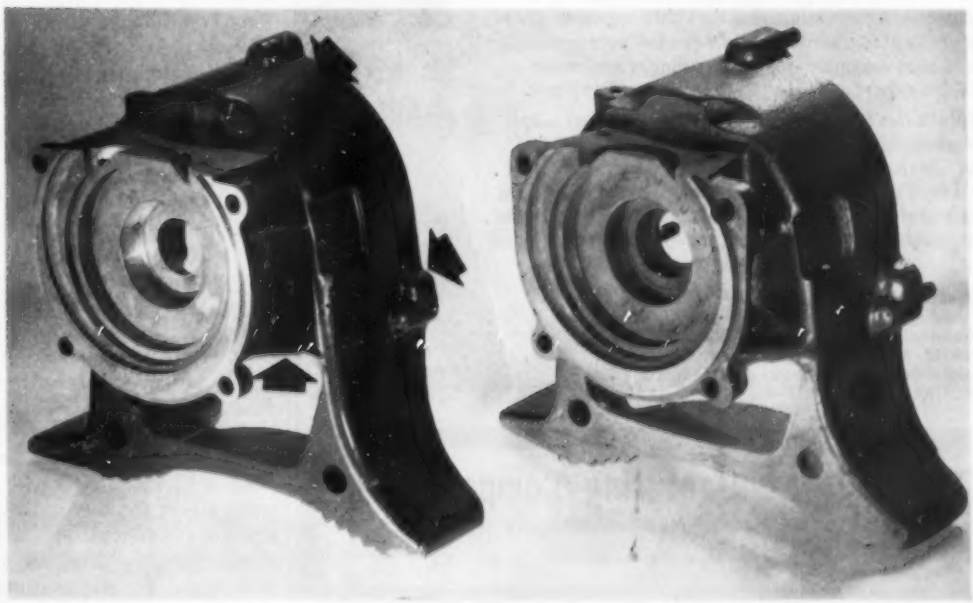
In a report issued by Ventures, Ltd., of Toronto, which owns 38.57 percent interest in Metal Hydrides, the outlook favors continued expansion of company activity in the sale of hydrides of less common metals such as titanium, zircanium, lithium, sodium, etc.

Simplified Solutions for product design problems

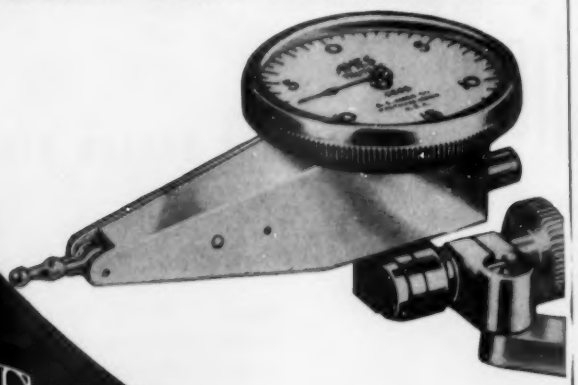


HELICAL GEARS can now be made by powder metallurgy, as shown by four examples, ***left,*** made by Merriman Brothers, Inc., who produce more than five million of them per year. These include casement window gears (bottom) and floor sander gears (right center). Gears are often made with .001 tolerance on holes and ±.002 on outside and pitch diameters. They are made with Plastic Metals reduced iron powder and processed according to the functional requirements of the gears.

WHERE WEIGHT and appearance are problems on sand cast housings, this before-and-after view of a conversion from sand cast to die cast magnesium illustrates the solution. The die cast magneto housing, ***left,*** is cast in Dowmetal R by Western Die Casting Company, and achieves lighter weight, smoother surface and cleaner detail. More than half pound of weight is saved as compared with the sand cast predecessor, ***right.*** Arrows indicate improved surface and detail, as well as thinner section of ribbing.



...to obtain cost reduction...



AMES uses HITCHINER precision investment castings

The B. C. Ames Co., Waltham, Mass., producers of some of the world's most accurate micrometer dial gauges, is another leading manufacturer who has found that accurate HITCHINER INVESTMENT CASTINGS reduce production costs by eliminating expensive machining operations. The Ames "Trutest" case is a typical Hitchiner bronze casting held to such close tolerances that finishing operations are kept to a minimum. To make this part from the solid or to use another type of casting would mean prohibitive expense, according to the Ames Company.

HITCHINER INVESTMENT CASTINGS permit, with only a few exceptions, complete freedom in the choice of ferrous or non-ferrous metals. The Ames Company chose beryllium copper for the clamp castings to gain proper metal density, freedom from fatigue, and longer life at much lower costs than machined steel clamps.

If you use small castings, your company, like Ames and many others, may be able to cut cost of components through HITCHINER INVESTMENT CASTINGS. We'll be glad to furnish prompt quotations on receipt of your prints. WRITE FOR FREE BOOKLET TODAY TO —

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OPPORTUNITIES

MFR'S. REPRESENTATIVES WANTED by progressive and expanding investment casting company producing both ferrous and non-ferrous alloys. Several selected and exclusive territories available. Write Box No. 7154, PRECISION METAL MOLDING magazine.

SALES ENGINEERS with die castings, or similar background, wanted for New York and New England territories. Write Box No. 7254, PRECISION METAL MOLDING.

FOR SALE—One American Pulverizer Co. No. 2400 Metal Turnings Crusher. One Dings Magnetic Separator 36" wide with standard electronic rectifier from 440 V to 230 V DC output. Write Box No. 7354, PRECISION METAL MOLDING.

WANTED — Experienced man in Philadelphia area specializing in plastic extrusion, stampings or die castings to represent prominent and well established custom molder with capacity for large and intricate parts by injection, compression and transfer molding. Write Box No. 7454, PRECISION METAL MOLDING.

U. S. REDUCTION CELEBRATES ITS 50TH ANNIVERSARY

The oldest independent aluminum smelter this year celebrates its fiftieth anniversary. A newly published brochure from the company traces the history and development of the U. S. Reduction Company of East Chicago, Ind. since its founding in 1904.

With an initial investment of only $5,000 and small melting equipment in their plant, the company was launched in a day when the aluminum smelting industry, as such, barely existed. The company's monthly output of ingot, the brochure points out, was hardly equal to the daily output from one of the company's big furnaces now.

Important among the products now sold by USCO are aluminum alloys for die casting, sand, permanent mold, plaster and shell mold casting, as well as zinc alloys for die casting.

HEAVY DUTY CONTACTS

continued from page 48

ties and freedom from galling and excessive wear under extreme use. For this job, the material was tested by rotating it in conjunction with four brass posts with ten pounds contact force. Its merits as a sliding contact were proved when the contact brush was rotated 1,052,000 times, thus making over 4,000,000 sliding contacts during the test. Contact wear in the test was only a few thousandths of an inch.

Being non-metallic, graphite reduces the welding tendency of contacts, improves the "surety of making contact" because it cannot tarnish or form surface oxides, and imparts self-lubricating properties. For these reasons, Graphite Gibsiloys, which include silver-graphite as well as copper-graphite materials, are used in circuit breakers and contactors, in rheostats, aircraft turrets, contacts operating against slip rings, in switches and relays.

Because graphite tends to retard brazing, these contacts are specially treated to provide a surface satisfactory for brazing with silver solder.

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SILICONE BOMB MOLD LUBE

The Best Mold Release You Can Buy! Forms a "Slick Quick"!

UNDILUTED
ODORLESS
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Dry Freon Propellent Protects Your Molds

PRICES:

Sample Can ... $ 2.00
Unbroken Dozen $18.00
(at $1.50 each)
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Further discounts on larger orders

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The BIG Switch to BIG Savings

Former Material Cost 30% More For This

Magnesium Yard Light Reflector

Many users of items die cast from non-ferrous metals are under the impression that magnesium, while extremely desirable for certain uses because of its light weight, is too costly. However, with the manufacturing and engineering know-how facilities offered by LITEMETAL DICAST, INC., it has been proved that magnesium products *need not* be too costly. Great savings can be effected with magnesium . . . in fact, this die cast yard light reflector formerly cost 30% more to produce when die cast from another material. In addition, the lighter weight of magnesium throws less load and strain on the supporting brackets.

Further cost reductions for this reflector were effected because:

1. The few machining operations required are more readily done with magnesium than with any other material.
2. The shipping cost of the final product is greatly reduced because of magnesium's lighter weight.

Let's Talk It Over . . .

LITEMETAL DICAST, INC., is an organization of specialists—men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs—little machines for little jobs . . . the right sizes and types of the most modern die casting equipment for producing parts from the size of a button to large structural parts. Complete facilities for secondary operations are also available.

Write today for literature and design information. Quick action on inquiries.

LITEMETAL DICAST, Inc.

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PLANT AND EXECUTIVE OFFICES

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Committees Start Working For Investment Casting Industry . . .

MATERIALS SPECIFICATION committees (l to r) Mr. Putnam, Mr. Martini, Charles Yaker (chairman), Dr. James Freeman, Roger Waindle.

INSPECTION & STANDARD quality practice committee: (seated) Herbert Kuebrich, (chairman) Charles Schwartz, Jack Henderson; (standing) B. W. Duncan, James Bly.

Educate Designers Concerning Investment Casting, Howard Urges

Expansion of the use of investment castings into more diversified fields was urged by Frank Howard, Sr., president of Howard Foundry Co., in addressing the recent meeting of the Investment Casting Institute in Cleveland.

Need for selling and education of engineers was stressed by Mr. Howard who pointed out that many commercial design engineers are familiar only with turbine blading as a use for investment castings.

Evidence cited by the speaker lies in the fact that 80 percent of the investment casting industry's volume is military work. He pointed to his own company's current expansion program as

ZINC AND ALUMINUM DIE CASTING
by NELSON METAL PRODUCTS, INC.

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MACHINING
FINISHING
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From layout drawings to the finished product results in a fine end product at a much lower cost, as shown in the above illustration.

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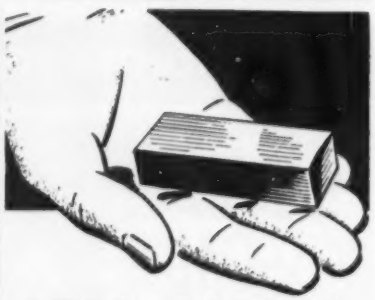

IT'S SMALL
BUT IT CAN SAVE YOU MONEY!

It's a Certified Alloy Melting BILL-ETTE for precision casting. Save costly, time-consuming cutting-up of larger units — choose from over 30 different alloys produced to exact specifications. Certificate of Analysis and Heat Number with each shipment. Packed in 100 lb. kegs.

For specifications and prices on Certified Alloy Melting BILL-ETTES and any metallurgical assistance you may need, write METALLURGICAL Division.

CHARLES DREIFUS COMPANY
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Serving the Steel Industry for Over 65 Years

Circle No. 19 on Reader Service Card
PRECISION METAL MOLDING

HOWARD FOUNDRY
continued from page 72

an indication that there is a wide potential for expanding application of investment castings, despite recent general economic trends.

In addition to an intensive job of selling, education and market development, Mr. Howard suggested that "the establishment of ground rules within our industry" would be desirable. He referred to assembled data on physicals and chemicals of the most common alloys used as "the type of information the engineer needs and, so far as I know, isn't getting from the industry as a group."

Inspection at every critical stage is the keynote of production. Visual inspection is augmented by X-ray, Magnaflux, and Zyglo when ever necessary and in some cases such as special turbine blading every casting carries an inspection wire for bend test examination.

One of the secrets of successful investment casting, according to Howard engineers, is proper arrangement of the individual castings on the sprue. Once the best set-up is achieved, a photographic record of the set-up is made so that future orders can be arranged in the same manner. Further this system of records has proven useful in the training of new employees.

Because of their advanced methods and extensive experience Howard engineers and metallurgists have been able to produce some of the largest and most complex investment castings that have been made commercially. Where the average weight of a steel casting was under two pounds only a few years ago, today the average weight is about eight pounds. Physical size of the castings has, of course, also increased from a maximum of about two inches to an average today of about seven inches on any one dimension.

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SCHWARTZKOFF PREDICTS TITANIUM STRUCTURAL PARTS BY POWDER METALLURGY

"The powder metallurgical process will be used for the production of structural titanium," Dr. Paul Schwarzkopf, president of the American Electro Metal Corp., 320 Yonkers Ave., Yonkers, N.Y., stated on the occasion of the Company's 25th Anniversary.

Dr. Schwarzkopf pointed out that powder metallurgy offers distinct advantages for the production of structural titanium parts for which he foresees a large demand. As far as other present research activities are concerned, Dr. Schwarzkopf explained that the main interest of American Electro Metal, which was founded during the first week of June, 1929, centers on materials and products for high temperature use.

Dr. Schwarzkopf had been one of the first to recognize that powder metallurgy will be the only practical processing method for the production of materials requiring high strength at temperatures exceeding 1500° F.

He visualized two possibilities: the use of refractory materials such as molybdenum, which has the required high temperature strength, but must be protected against oxidation by the development of suitable coatings; or the creation of new hard metal compositions which exhibit both the required mechanical properties and the required oxidation resistance at high temperatures.

The company's present plant and laboratories contributed during World War II two significant developments: the first was the mass production of pure iron pole pieces for field telephones, thereby eliminating a bottleneck in war production; and the development of the small porous nickel cup which was used as safety device in the well-known proximity fuse. According to a release by the United States Navy, the control of porosity required in this part exceeded anything previously conceived.

PERMANENT MOLD CASTINGS

An Economical Mold Material For Accurate Casting Of Aluminum Alloys

By C. E. HERINGTON
Meehanite Metal Corp.

TOP QUALITY aluminum castings with as-cast tolerances of ± 0.010 and closer are now being produced in permanent Meehanite molds at Pacific Cast Products of Alhambra, Calif.

Although some individual molds have been used to make as many as 500,000 castings before they were worn enough to be salvaged, company officials say they have been able to handle production runs calling for 200 to 500 castings per mold with more economy than could be expected in utilizing other types of tooling.

Less than 1 percent of the castings have been rejectable, even where the highest quality standards were maintained.

Aluminum articles that have been successfully cast in these molds include instrument components, pulleys, housings and standardized aircraft fittings with weights ranging from two ounces to eight pounds. They comprise virtually all castable types of aluminum — with emphasis on the Alcoa 356 alloys.

The mold components are designed so that they can be machined from stock Meehanite materials with equal thicknesses in each case, since molds with varying wall dimensions could not be heated or cooled in the most desirable manner.

Continued next page

PROCESS AND PRODUCT . . .

Pouring molten aluminum into a Meehanite mold at Pacific Cast Products' plant is shown at top. Removing a casting from a mold is shown below.

Particular care is taken in gating the molds to avoid uneven configurations and projections which might cause turbulence in the molten alloys that will be cast therein, since turbulence is one of the main cases of defects such as extreme porosity in castings produced in permanent metal molds.

Generous fillets and blendings are incorporated in the mold designs not only to minimize the possibility of shrinkage and cracking, but to equalize the distribution of the service loads that will be applied to finished castings.

Where cores are essential to the production of castings, provisions are usually made for the incorporation of dry sand moldings in the cavity assemblies.

Further provisions have been made for the incorporation of inserts (such as tubes, bushings and threaded parts) in the mold cavities. The most common inserts for aluminum castings include iron and steel. However, copper and brass inserts have been satisfactorily employed where it was possible to prevent their solution in molten aluminum.

The main cavity components are hinge-assembled so that they can be opened and closed with maximum efficiency, and dollies are used to move the respective molds to positions near the furnaces where aluminum is melted before they are loaded in order to avoid excessive heat losses in the process of ladeling molten metals into the mold cavities.

To prevent defects due to the rapid chilling of cast aluminum, the molds are torch-heated to temperatures of about 500 or 600 F. prior to the beginning of each work period. No additional heating is normally required during a work period, because the preheat temperatures are usu-

DATA FOR THE CASTING DESIGNER:

BOTH BUYERS AND PRODUCERS of castings are vitally interested in new developments that will either improve casting quality or reduce over-all costs. Here are data to illustrate the results obtained by using Meehanite molds for permanent mold casting.

Typical Properties of Aluminum Castings in Meehanite Molds

Alloy	Specific Gravity	Weight, Lbs. Per Cu. In.	Tensile Str. Psi	Compressive Yield Str. Psi	Shear Str. Psi.
43	2.69	0.097	17,000	9,000	14,000
108	2.79	0.101	19,000	15,000	17,000
112	2.91	0.105	19,000	16,000	20,000
113	2.92	0.106	24,000	20,000	22,000
138	2.95	0.107	26,000	30,000	24,000
B195-T4	2.80	0.101	33,000	20,000	30,000
A214	2.68	0.097	22,000	17,000	22,000
333-F	2.77	0.100	28,000	19,000	27,000
355-T51	2.71	0.098	27,000	24,000	24,000
750-T5	2.68	0.097	33,000	27,000	32,000
356-T6	2.87	0.104	18,000	8,500	13,000

DATA FOR THE CASTING PRODUCER:

Physical Properties, General Engineering Types of Meehanite Metal

Type	Tensile Strength psi	Transverse Strength 1.2" Bar — 18" Centers Load psi	Deflection Inches	Brinell Hardness Max.	Compressive Strength psi	Modulus of Elasticity psi	Fatigue Strength psi
GA	50,000	3100-3600	.28–.34	207	175,000	20,000,000	22,000
GC	40,000	2900-3300	.26–.34	192	150,000	17,000,000	17,500
GE	30,000	2000-2600	.20–.34	174	120,000	12,000,000	13,700

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Prouce Up To 6000 Aluminum Castings Per Day

ONE OF THE LARGEST aluminum permanent mold castings to be produced in the new type molds is displayed here by W. D. McCave, co-owner of Pacific Coast Products.

ally maintained by the aluminum that is cast in the molds.

Three Knapp furnaces, each having a 500-pound capacity, are used by the company in the process of manufacturing as many as 6,000 castings per day.

The time required to solidify an aluminum casting in one of these molds is, of course, variable — depending on the size of the mold, the quantity and pouring temperature of the alloy, etc. However, most molds can be unloaded within two to five minutes after they are filled.

Following unloading operations, the castings are "deflashed" and otherwise machine finished in the usual manner.

Table I shows typical physical properties of the aluminum castings now being produced in 300 active Meehanite molds which have an estimated value of about $400.00 per mold. Properties of the mold material are given in Table II.

CHARLES R. WIRTH TO HEAD ECLIPSE WEST COAST OFFICE

Charles R. Wirth has been named district representative by Eclipse Fuel Engineering Co., Rockford, Ill., for the company's newly-established West Coast district office, it was recently announced by company officials.

The new Eclipse office is listed as Industrial Combustion and Furnace Co., P.O. Box 3275, Glendale 1, Calif.

G-E TO BUILD PLANT FOR INDUSTRIAL FURNACES

The General Electric Company will begin construction this year of a new $5,000,000 plant at Shelbyville, Ind., to manufacture industrial furnaces, induction heating equipment, and heating devices.

The announcement was made by E. W. Cunningham, general manager of the company's Industrial Heating Department, which will headquarter at Shelbyville.

When completed in 1955, the new plant will accommodate manufacturing operations now located at Schenectady, N.Y. and Pittsfield, Mass.

In explaining the move, Mr. Cunningham pointed out that "it will allow consolidation of facilities now located at Schenectady and Pittsfield, which are not sufficient to keep pace with the expected market increase."

Construction of the new plant is expected to begin in September of this year, with actual production getting under way sometime in 1956. Employment eventually will be about 800.

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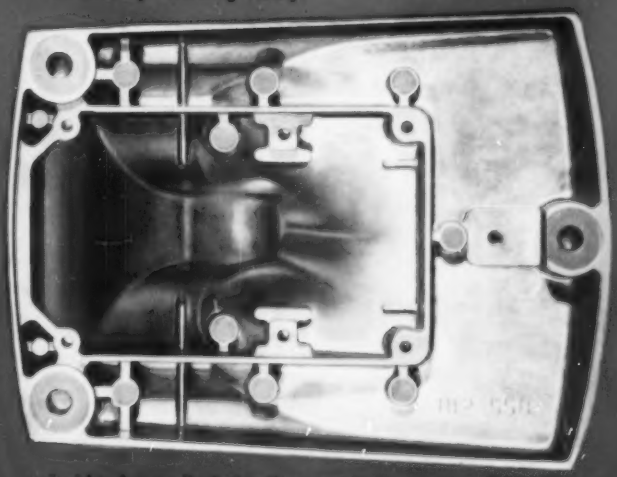

Inside: A complicated pattern precisely reproduced.

Changing from a cast-iron to a die cast base for one of their popular fan models has resulted in 10 specific benefits for this highly-pleased manufacturer.

Here they are, according to a company spokesman:

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   b. Heat treatment and sand blasting.
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3. The elimination of filling rough spots found in cast-iron castings.
4. The elimination of tapping four holes in the cast-iron bases. Die casting makes possible the use of self-tapping screws because of the softer metal involved.
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6. Lighter die-cast bases provide a freight charge saving in the shipment of finished goods.
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8. Die-cast bases, when stocked prior to entering our production line, are easier to stack because of more uniform base thicknesses—save time and storage space.
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10. Die-cast bases give a consistent quality with a high daily productive capacity.

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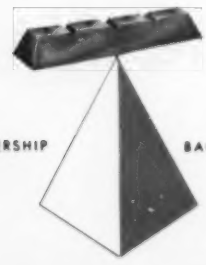

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